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L. E. Sewall

CHOREA

ON CHOREA

AND OTHER ALLIED MOVEMENT DISORDERS OF EARLY LIFE

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LONDON
SMITH, ELDER, & CO., 15 WATERLOO PLACE
1881

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PREFACE.

THE object of this book, a portion of which has already appeared in medical journals, is to place before the reader such an account of Chorea, and of the theories which prevail concerning it, as shall enable him to form some judgment as to the nature and suitable treatment of a disorder which is not very common in ordinary practice, yet subject to so many varieties that the study of a few examples gives no adequate conception of its true character.

The first and chief part of the work is occupied with a description of Chorea and of the several hypotheses which have been provided to explain it; the rest is devoted to an examination of these theories in the light of admitted facts, together with an account of that particular view of the pathology and management of the affection which a full consideration of its phenomena seems to suggest. The Appendices, referring to a large number of cases which have been under my own observation and treatment, claim to furnish some of the evidence upon which the conclusions of the book are founded.

In expressing dissent from all anatomical explanations of Chorea, it has been necessary to refer to many eminent

authorities who have attempted to reach its structural basis. In so doing I must not be understood as setting up my own opinion against accepted doctrines of pathology. The failure, or at least the ambiguity, of morbid anatomy in this particular is not denied, and in calling attention to it I have only given utterance to what is generally admitted. If it should be thought that too much space is occupied with such controversy, the apology must be that the subject in its present stage cannot be otherwise dealt with, and that it would be absurd to discuss the treatment of Chorea until we have come to some agreement as to its nature.

My purpose throughout has been to show that Chorea, no less than the many smaller movement transgressions which resemble it, is a disease of function due in large measure to preventible causes; that the nature and circumstances of children render them apt subjects for such a disorder; and that, while it is beyond reasonable expectation that the course of childhood should be kept altogether out of its reach, we are not without guidance as to the sort of training and management which affords the surest protection against its attacks, and the best material for its cure.

85 Wimpole Street:
October 16, 1881.

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Page 147, *line* 1, *for* hopeless *read* helpless

INTRODUCTION.

THE PLACE IN NATURE OF FUNCTIONAL NERVOUS DISEASE.

THERE exists in some quarters a disposition to discredit—and even to deride—the reference of disease, and especially of nervous disease, to functional causes. 'Functional or unsubstantial diseases,' it has been said, 'are flitting before the microscope like ghosts at sunrise. Nervous disorders, the most evasive of all, are becoming tangible.'[1] I am not about to dispute this assertion, but rather to ask what it means. Functional disorder of some degree, I suppose, everyone must admit, inasmuch as the elements of such disorder are to be met with universally. Granting that there is a wide difference between ordinary emotional spasm and hysteric convulsion; or between the temporary fidgetiness of shyness and the long-enduring agitation of chorea, yet still there is a region intervening which is occupied by muscular disorder of an equivocal kind. The question is, what degree of such disorder is to justify the anatomist in making search for its material expression? No one will answer any degree of it whatever, since that would be to include the whole of mankind, and would involve the absurdity of making disease a universal possession. We are entitled to ask, therefore, how far and in what manner that orderly action of the voluntary muscles which hypothetically represents health may be departed from before disease becomes 'tangible;' if indeed we may not ask

[1] *The Art and Science of Medicine.* Introductory Address at St. George's Hospital, by Dr. Dickinson.

yet further upon what authority any particular method of muscular conduct is insisted on rather than another as being its proper pattern, all declensions from which are to be regarded as morbid.

No one will deny, I suppose, that the several conditions of consciousness find a ready and accurate expression in the movements and attitudes of the body. So peremptory, indeed, is this union between the mind and the muscles that the term 'voluntary' commonly given to the latter is only partially applicable. It is true that the more violent gestures get subdued and toned down by education, and that custom and imitation supply a certain number of conventional and meaningless movements, yet the muscles are not the less expressive on that account. We are seldom deceived as to the nature of emotion on account of the effort of repression which is used. On the contrary, we can see and measure the force of both.

The monotony and uniformity of civilised life tend of course to reduce these motor phenomena to a minimum. The full display of passion or emotion is rare, and when it occurs the sympathy of the observer is so far enlisted as to divert attention from the mere muscular condition apart from what it expresses. Thus the several modes of response to as many different states of consciousness, the spasm of horror, the restlessness of embarrassment, the tremor of fear and sudden disaster, violent and discomposing as they are physically considered, pass without notice, or are noticed only for the meaning they convey, just as the movements of the tongue and lips are not considered in themselves or apart from the words they utter. What would be really surprising would be the absence of these several emotion movements, or still more, the expression of any one emotion by means of muscular movements such as we are accustomed to associate with another. Thus while many phenomena of movement which are involuntary and disabling are readily accepted as amongst the natural endowments of the individual no less than are the acts which are

voluntary and deliberate, yet must it be provided that each of these shall have its proper motive. Anger excites spasm, fear tremor, mental embarrassment restlessness, and so on. A tremor with no particle of fear or dismay to justify it, a rigid spasm with no sensation of anger or suspense, a restlessness of the limbs with the mind at rest—these are conditions which require a separate explanation. The ordinary laws of emotion movement do not provide for them. Some extra and separate motive must be sought for.

But while thus ascribing to emotion a great variety of muscular phenomena, it is necessary to remember that this particular motive extends over a wide range including even in some individuals the ordinary conditions of existence. In some temperaments and at some periods of life the most common incidents will suffice to provoke emotion. Familiar illustration of this is seen in childhood, whose ordinary movements indicate a ready and constant yielding of this kind. Again, the spasmodic movements and involuntary gestures of youth are due to such nervous exaltation as is with them habitual, and, indeed, proper to that stage of physical development. And we may say generally that what occasions emotion in one, with its accompanying bodily disablement, will brace and nerve another to his fullest capacity. We cannot say beforehand how or when emotion phenomena will be excited. We know only that, while different individuals are variously removed from emotion, there is no one altogether beyond its reach; and that the response to such emotion is by means of particular movements, spasms, and palsies common to all mankind.

But we need not confine ourselves to emotion alone, we may consider as well the ordinary movements of intelligence, those muscular acts by means of which we are always expressing during our waking hours the common current and transitions of thought and sentiment. Such movements, although of the same instigation as the emotional, are so directed and governed by the will as to subserve the purposes of intelligence. The period of life

when these movements are the most precise and orderly is that of early middle age, when the muscular frame, while it maintains stillness without obvious restraint, exhibits at the same time by the disposition of the limbs and features the ability to move with alertness, and to use the muscles for intelligent expression without surrendering them to spasm or palsy. He is manifestly the best upon whom this self-imposed control sits the easiest. Rare anywhere, such composure is hardly to be looked for until such time as the comparative calm of middle life has been reached. And what always finds place in such a deportment, side by side with the various sentiments that are animating it, is the continual, watchful presence of self-control, a control of which the highest exercise is seen in the power to maintain a vigorous, capable, unconstrained stillness of the whole frame.

This rare perfection of muscular government, I say, is the end and outcome of a lengthened training having for its object not so much to direct the movements as to restrain them. The limbs which are thus disposed have but lately emerged from a condition of continuous, impotent movement where they have been swayed about under an influence lower than the reason yet overpowering it. Even now, if anything should occur to disturb the even balance of the mind the restless, motiveless movement of the earlier time would reappear.[1] The best and fullest power of control, indeed, never becomes altogether spontaneous and self-acting. It is not only easily overborne by passion and

[1] It will be seen in the sequel that familiar and widely recognised facts such as these are expressed with great variety of phrase. Thus, for example, Professor Bain speaks of a 'central spontaneous energy or activity as a fundamental and permanent property of the system.' 'The active display of the muscles,' he says, 'is most usually and abundantly brought into play by the stimulus of our various feelings, yet is there no reason for supposing that dead stillness would be maintained if outward prompting were withheld.' He further speaks of the restless activity of childhood as 'only to be accounted for by a central fire that needs no stirring from without.'—See Bain on *The Emotions and Will*, Part. II. Chap. I. What I desire of the reader throughout this discussion is that he will separate facts from expressions, and not accept any technical paraphrase or generalised statement of phenomena in the light of new knowledge.

emotion, but its constant exercise is so difficult and irksome that any occasion for being rid of it is readily taken advantage of. Herein we have one of the uses of laughter, that half-voluntary spasm which in many states of mind affords welcome relief from complete muscular order. Again, the best deportment will seek relaxation by means of a variety of distortions, stretchings and grimaces so soon as these may be indulged in without observation. Such acts are proportioned, as everyone knows, not to the mere bodily fatigue, but rather to the degree of constraint that has been called for, extreme ceremonial or extravagant gravity needing a larger measure of such relief than the common business of life. It is easy to see that the circumstances may be such as to make the natural craving for this kind of indulgence quite irresistible, insomuch that it has to be yielded to in public as well as in private, and gets noticed and stigmatised as disease.

And along with this careful control of movement in the presence of others and its relaxation afterwards, we have to consider the obedience that we owe to a conventional code of conduct. Although, as we have seen, there can be no actual uniformity of muscular response, but each of us must act after his own prompting, yet is there a strict pattern set up for general imitation. Whoever errs from that pattern, as by too ready or too violent a display of movement or of spasm, soon finds that these extra acts of his, which would be accepted and allowed if appearing upon proper occasion, subject him to express notice, and (during the tutored period of life at least) to rebuke or ridicule ; and, inasmuch as muscular obedience is more difficult when it is thus observed upon and mistrusted, and the loss of confidence in movement is an extra incentive to error in movement, we have here conditions which must tell directly on the side of disorder.

It thus appears that muscular response varies very widely with the individual, the time of life, and the circumstances. We can give no stricter account of it than this : that it will be such or such, according as the conditions in their different associations combine

to make it. With certain methods of movement and of spasm, ascribed generally to emotion, we cannot say beforehand what is the material which each individual will find sufficient for emotion, the very same cause which disables one bracing up another to his best response. With certain conceptions regarding the voluntary muscles as obedient agents of the will, and moving only at its bidding, we find, in fact, that their natural and untrained state is one of constant movement, which is so imperative that the best discipline, far from controlling it absolutely, serves rather to disguise its necessity by giving it some show of purpose. With a certain ideal pattern as to the demeanour which is the fittest, we never actually attain such demeanour ; it is not even approached except by long and careful training, and the effort that holds it is always ready to escape. With certain aids to orderly muscular conduct provided by the public sentiment, we perceive that, after a while, the preservation of a set attitude becomes intolerable, and that the help which outside observation gives at first to order and stillness, it gives at last to disorder and involuntary movement. I am not asking now how much, or how little, of muscular disorder actually arises from this wide reach of emotion, or this infirmity of control over movement, or this disturbing influence of having to conform to a pattern ; I only say that we have here the elements of disorder—material out of which it is inevitable that disorder should spring and grow. Yet to what degree such disorder may spread under the most favouring conditions, or what particular phenomena of so-called disease may be thus accounted for, is a separate question.

And while we thus perceive that the muscular control is variously evaded at the successive periods of life, and take it for a law that the novelty of childhood, the access of new passions in youth, and the monotony of old age should each in turn serve to produce the characteristic movements and attitudes of those periods, it is easy to see besides, how, in a community like ours, the several causes of muscular disobedience and disorder should

press unequally at different ages. It is to be observed, especially, how the motor infirmities of early life get confirmed and intensified by the treatment they meet with. Thus, for example, the natural restlessness of childhood is directly fostered in having to bear the additional strain of observation and rebuke. The prevailing methods of education, which are designed to repress movement, serve, in fact, only to disfigure it. The attempt to enforce stillness of the body at the same time that the mental capacity is being tasked, does direct violence to the natural laws of movement. The emotional period of young women is similarly beset by the tax that is put upon it in the readiness of others sometimes to ridicule, and sometimes to pity, emotional displays which might fitly pass without notice.

And this extra and artificial strain, which is thus put upon youth in general, might perhaps be still further defined as operating with its utmost force at certain stages of development and under certain social conditions. There is a time in every childhood when the desire for movement is the most active and the least within control; there is also a time when, by our conventional rules of education, the penalties that are put upon movement are the most severe. The nearest coincidence of these two periods, both of which may be fixed approximately, ought to indicate the age when the frequency of movement disorder is the greatest. Similarly, at a somewhat later period of life, with the fuller control of movement which age naturally brings, we should expect a comparative calm, until upon reaching puberty a new source of disturbance would have to be encountered. Thus, not only might we predict that the factors of movement disorder, which we see so variously combined, must appear every now and then in such combination as to bring disorder into special prominence; we might go further, and indicate particular periods of life and states of society whose conditions are such as to favour this combination.

Such conclusions, as I have said, must be brought to the test

of facts. Is the disorder which we thus prefigure actually found; and does it attach by preference to the periods here indicated? Are its apparent causes of a mental or a material kind? Does it prevail more or less according to the social condition, or everywhere alike? Are the particular muscles it affects such as emotion selects, or such as structural disease selects? Is the actual search for its material cause successful or unsuccessful? The answer to such questions involves the investigation of the several diseases which, rightly or wrongly, have been classed as functional; and does not concern us now. It is evident, at least, that such an investigation may be undertaken free from any antecedent objection, and that functional disease, although necessarily beyond the field of the microscope, is not 'unsubstantial' in the sense of being unreal.

But the varieties of muscular conduct are not confined to the circumstances of youth, or the special urging of emotion. We have to take into account, besides, such deformities as arise from inherited and acquired tricks and habits, from the natural tendency of human beings to copy one another, and from modifications in the use of the muscles which spring from their frequent employment in some particular way. Innumerable movement disorders are of this origin. Take any man or woman out of the crowd, and how many will be found the involuntary acts and spasms which contact with the world has produced or exaggerated; how many movements are purposeless and imitative; how complete is the transition, in gesture, and demeanour, and manner of response, under observation and in solitude—when inspirited and dispirited—anxious or assured. In all these varieties of movement response, which is to be regarded as the normal and healthy one? I do not say, which is the most convenient and useful—for, however precise the definition may be from that point of view, that is mere matter of sentiment and convenience, and has no right to be heard in the question—but which is the proper healthy pattern? Is it that in which the muscular response is the quickest

and readiest, the state of body always verging upon spasm and ready to exhibit emotion by means of the most violent convulsion; or is it that in which the muscles are under full command and no expression is allowed to escape except such as the will and judgment approve, the rarest and least attainable of all human conditions?

The full significance of such considerations as the foregoing will be best seen by observing how the case stands with the most sensitive muscles of all, namely, those of the face. If only the principle be admitted that there is nothing special in the movements of the face muscles excepting in their alacrity of response, and that a mental impression of whatever kind needs only to be deepened a little to make its motor response spread from the features to the limbs, we shall see then, in the study of this particular region, that spasm, and paralysis, and numerous acts of disobedience on the part of the muscles are part of the daily life of everyone; that, indeed, the precise conduct of the muscles can only be predicted by a knowledge both of the will that informs them and of all the circumstances in which they are placed; that to speak of the normal condition of the muscular system is to speak without precise meaning.

Any example taken from some more restricted field, with a view to illustrate this position, might no doubt be so used as to misrepresent it. Yet, keeping within the strict terms of the comparison, we may say of the muscular system, as of any system of mechanism, that so long as it remains competent its conduct will vary with its adjustment, and that such variation is the test of its integrity. The most approved clock for present service is the one whose minute-hand occupies precisely an hour in making the circuit of the dial; but the best clock is the one that is most obedient to its regulator, moving quicker or slower accordingly.

But, while we are thus compelled to admit motor disorder as a necessary ingredient of life, we do not admit it indefinitely. There are the muscular phenomena of functional origin—spasm

or tremor, or palsy—and there are the very same conditions due to substantive disease ; nor would it be difficult to point out, in general terms, the different associations of the two. I am concerned at present, however, only to show that there is a place in nature for functional nervous disease ; my next object will be to make out the claim of a particular affection to occupy that place. There is in the mind of each of us a certain pattern of muscular capacity and muscular control, as it ought to be, and there is the larger and less definite pattern which comprehends the actual range of muscular conduct under all circumstances. It is because these patterns are not co-extensive that we need the service of such a word as functional disease to express the difference between them, and occupy the ground which the narrower of the two leaves uncovered.

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CHAPTER I.

GENERAL DESCRIPTION OF CHOREA.

Pedigree—Definition—Parts affected—Degrees of severity—Mental involvement—Temperament—Age—Sex—Adult and senile chorea—Geographical distribution—Causes—Varieties—Progress—Paralytic symptoms—Recurrence—Connection with heart disorder—Sequelæ.

In attempting to give some account of the history and relations of chorea, I deem it unnecessary to describe the various dancing epidemics from which it takes its name. Chorea for us begins with its definition by Sydenham. It may, indeed, at first sight seem strange that a movement extravagance of the middle ages, having its origin in pious fervour, finding its subjects amongst the emotional and the credulous, and its cure in some supernatural agency, should have transmitted its name to a purely muscular commotion of children to which the patients are often themselves indifferent, while they are but ill-furnished with that religious sentiment which provided both the cause and the cure of the ancient disorder.

It is remarkable that every epidemic of the kind of which we have any account grew and spread out of material of its own providing. It was never that with the decline of the disorder the terror subsided; it was always the converse of this. The epidemic disappeared as soon as it ceased to inspire the terror or attract the attention, which was one of its essential factors. In other words, the gesticulations and dancing (although in great measure involuntary) had the strength taken out of them when the popular tribute to their reality was withdrawn. So long as the priests'

exorcism or pilgrimage to shrines was held to be necessary, so long, to the great annoyance of their victims, the muscular contortions flourished and spread; but they could not survive neglect. It will be seen from Hecker's account of these popular seizures that they did not decline from want of subjects, but from a change in the public sentiment. The patients who came latest were discredited. They were not impostors any more than the others, except so far as the knowledge that they would be so accounted tended to make them so. The same affection, that is to say, neither more nor less real than at first, had lost the necessary element of public sympathy.

The current of opinion changes, but men and women remain the same. There is ample evidence in the experience of the present as well as in the dancing and jumping manias of the past, that conscious convulsive seizures need external support for their perfect exhibition. Wanting this, the explosive violence of their discharge (to adopt the language of current pathology) is diminished. Thus, while the example of others suffering, and the knowledge that bystanders are disturbed and impressed, combine to make the circumstances most favourable for the development of such epidemics, the knowledge that the particular symptoms will be recognised only to be discredited, and that those who yield to them are neglected or despised, make the circumstances most favourable for their suppression.[1]

We are not too readily to assume that the chorea we are now to consider is altogether different from the epidemics of old.

[1] Upon this subject, in reference not only to popular movement distortions, but also to witchcraft and modern miracles, I would refer the reader to Lecky's *History of Rationalism in Europe* (vol. i. p. 89, et seq.), where it is well shown that the belief in all such phenomena, genuine alike on the part of performer and observer, required for their due exhibition the joint operations of the two. They resulted from 'a general predisposition to see Satanic agency in life which grew from and reflected the prevailing modes of religious thought, and declined only when those modes were weakened or destroyed.' With all the distinctive features of our present chorea, we shall find in the sequel, if I am not mistaken, that this affection in many of its modes is largely influenced from without.

The very same form of muscular derangement that Hecker describes is with us still, in such dwarfed dimensions as the altered circumstances permit. Its motives and methods of cure are the same now as formerly, and if it is less common or less contagious, the reason is to be found in the wider spread of education. But the healthier public sentiment which has overwhelmed in neglect and contempt, together with witchcraft and sorcery, the various movement extravagances due to ecstacy and fanaticism, has brought into greater prominence the muscular disorder of childhood which we now call chorea. The first mention of chorea indeed as a disease peculiar to children coincides with the time when the growing influence of education had acquired strength enough to deprive the popular epidemics of their necessary motive. Along with this change the disorder ceases to be regarded from the old point of view, and descends to a different class of subjects. The notion of demoniacal possession is abandoned, and attention is rather directed to such features of the malady as tend to link it with ordinary disease. It is due to a *materies morbi* in the blood, to the lodgment of fibrinous clots in the brain, to a new development of articular rheumatism. Such altered attitude of the observer makes an alteration as well in the thing observed. Chorea has changed its shape for reasons which we can partly explain, yet some of the old lineaments are still discernible. The motor disorder which now plagues our children still clings to the same sex as of old, it chooses by preference the same temperament, and is apt to be aroused by precisely the same causes.

Of the many attempts that have been made in our own day to *define chorea*, none can be regarded as altogether successful. It has been described as 'an irregular convulsive action of the voluntary muscles,' but it is not necessarily convulsive, and not always confined to the voluntary muscles; as 'a tremulous, irregular, and ludicrous movement,' but there is nothing of tremor

about it, and not much that is ludicrous. Sydenham's comparison of chorea to the feats of Merry Andrew is familiar to everyone. The more modern definitions are confessedly faulty and inadequate. In the latest treatise upon the subject Professor Ziemssen declares that it is only possible as yet 'to aim at a definition.' In his own description he is chiefly careful to discriminate between true chorea and the so-called chorea major; the latter as he believes being 'the product of hysteria or of genuine psychoses and cerebral maladies.'[1] By true chorea he understands 'a neurosis of which the seat (as it seems) may sometimes be the brain alone, sometimes the entire nervous system; characterised by incessant twitchings or jerks of groups of muscles, which are sometimes spontaneous and sometimes excited by voluntary impulse, which occur almost exclusively in the waking state, and are accompanied by a more or less developed psychical disturbance.' It may be questioned whether such definition really pictures the affection to anyone not already familiar with it. To ordinary observation, at all events, chorea consists in an exaggerated fidgetiness. It is an extravagant exaltation of that continual unrest which is the natural characteristic of childhood. Its movements, that is to say, resemble the emotional, the same muscles being affected in the same kind of way. Chorea, therefore, may be imitated as emotion may. But up to a certain point only; extreme chorea, like extreme emotion, is beyond imitation, for there belongs to both a degree of spasm and distortion which can never be assumed, or only partially and for a moment.

Consistently with this comparison the muscles of the *upper part of the body* are much more often affected than the rest, and the hands suffer most of all. The thoracic muscles seldom escape altogether, but it is only exceptionally that their concern in the disorder is a prominent feature. The lower limbs are never

[1] Ziemssen's *Cycl.*, vol. xvi. p. 418.

affected alone, although they may be the first attacked.[1] In the chorea of elder children and of grown-up girls the face is almost always concerned. The more disturbed limbs, or those in which disturbance lasts the longest, become eventually weakened, the loss of power being sometimes very obvious. Certain groups of muscles indeed may appear to be altogether disabled. Thus the hand may hang from the wrist, and even for a while be incapable of full extension, or, less commonly, the arm or the leg muscles may become relaxed and motionless. Complete paralysis, however, is rare, and, as a very general rule, there is neither failure of nutrition, loss of tactile sensibility, nor alteration in the muscular response to the induced or continuous current.

Chorea is commonly more marked on one side than on the other, and not seldom it affects one hand, or one arm, in especial.[2] For reasons that will presently appear, much stress has been laid upon chorea confined to the arm and leg of one side, so-called *hemichorea*. M. Sée, in 154 cases, found chorea confined to the left side, *or more marked there*, in 97. But this is obviously not to the point, since it fails to distinguish hemichorea in any accurate sense. Dr. Pye Smith, however, found 33 out of 150 *confined* to one side. For myself, I cannot recall a single case of chorea of any severity continuing throughout its course limited to one side of the body and including both arm and leg. That chorea commonly begins in one side, we all admit; that it may continue confined to a single limb until it gradually disappears, we may admit also; but a violent chorea of one side, in which the other side in no degree shares, is, I believe, almost unknown.

The *speech defects of chorea* are of many kinds and degrees. Sometimes speech will be rendered difficult and uncertain owing to imperfect command of the respiration, causing occasional

[1] So Romberg, *Sydenham Society's Trans.*, p. 56, with which my own observation accords.

[2] Compare with the statements here given the figures quoted in Appendix B, in reference to the starting-place of chorea.

arrests in speech, or the words to be violently jerked out.[1] At other times there is difficulty in setting the vocal apparatus going; the answer to a question will be delayed, as though the other muscles were so busy as to leave no place for speech. In extreme cases of this kind, the lips will be seen to move, but the attempt to utter word or sound will go no further. Another kind of speech disorder arises from imperfect muscular co-ordination, and is seen best in the elder patients, giving to their words that indistinctness and confusion of syllables which is characteristic of drunkards. These speech disorders are in no constant relation to the choreic disturbance elsewhere, and, with severe chorea, speaking may be little or nothing affected. But where speech difficulty occurs, it is commonly an early symptom, and may be the very first. That it may be rightly appreciated, it is well to bear in mind that speech chorea, like chorea in other parts, is a muscular disorder. Aphasia, or any other form of misuse or disuse of speech due to cerebral defect, and not to faulty working of the apparatus of speech, is not met with—or, certainly, is very rarely met with[2]—in chorea.

Defects of deglutition, less common than those of speech, follow much the same rule. It is not that the power of deglutition fails (although even this may occur), but that, in severe cases, there is first the difficulty of food reaching the mouth, and next the difficulty of its being dealt with by the tongue and lips.

The *body temperature* is almost always slightly raised at first, in the more violent attacks; but, with remarkable uniformity, *it tends to fall below the normal afterwards.* It will be easily understood that in the utmost severity of the choreic paroxysms trustworthy observation upon this point is impossible. The highest temperature I have succeeded in taking was 100·6; the lowest,

[1] Ziemssen, *loc. cit.* p. 436, has called particular attention to the various laryngeal defects of chorea. My friend and colleague, Dr. de Havilland Hall, has made many attempts to inspect the larynx in cases of children with marked speech chorea; but for obvious reasons this is a task of much difficulty.

[2] See case 14, Appendix A.

95·8. Contrary to the opinion of Ziemssen (*loc. cit.* p. 440), that the body temperature is not changed even in severe cases, I believe it to be very rare for the normal heat to be maintained, although the variations are not considerable. The *pulse* is commonly quickened, it is often variable, and sometimes uneven or distinctly irregular. During severe paroxysms it may exceed 120. The state of the circulation, however, will come for separate consideration presently.

The degree of severity of chorea may be well measured by observing the patient's posture in bed. One effect of the continual working of the arms and shoulders is to push the body low down in the bed, thus drawing the head from the pillow, and bringing the whole frame into a horizontal plane. At the same time, the patient remains constantly on the back, so as to allow full play for the extravagant limb movements. Lying thus, the reckless disposition of the arms in their short intervals of rest is characteristic. They remain, so to speak, where they fall ; the flexed arm and wrist lying over the chest, or the limb hanging down loosely over the bed-side.

With its prone position and the depression of the head and shoulders chorea thus comes, by an accident, to resemble enteric or typhus fever. In the worst cases, indeed, when the violent movement has given place to prostration, this resemblance of posture is complete. It may be added that in severe chorea, as in fever, the position in bed from day to day—a little higher, or a little lower—is a valuable indication of the progress to better or worse.

In the commonest form of chorea—that, namely, which is found amongst young children, and is of long duration but moderate degree—*two varieties* are to be recognised. In the one, the patient's movements are at their worst when he is conscious of observation, and at their best when he is left to himself. In the other, there is a considerable power of control when the effort is made ; but without it, as when at play, or in simple muscular acts, the unsteadiness and disorder become very

apparent. This latter variety is by far the more untractable of the two.

Yet, even in severe chorea, it is less true to say that the child cannot be still than that it is unable to maintain stillness. By an effort and for a moment movement can be stopped wholly or partially. And it is curious to notice the effect produced by making appeal to the child's understanding. If, for instance, he is invited not to be still, but to move to the utmost, it will commonly happen that the character of the movement is for the time altered, and probably diminished. Similarly, attention directed to a particular limb serves, in a measure, to quiet that particular part.

Notwithstanding the inconvenience of chorea, young children take it very composedly. They eat and sleep well, and are in no way mentally disturbed : the *mental disturbance* comes later. Thus, it is common to find after the age of ten that at the first onset of the affection, or even before it, the child becomes fretful, or capricious, or passionate. It is easy to understand that with these elder children the temper is continually tried by the disobedience and riot of the voluntary muscles. At a later period still —at and after puberty—the ceaseless agitation of the limbs, in spite of the will, produces a state of mind little short of terror. It is at this time of life exclusively, so far as I know, that chorea becomes blended, in various degree, with delirium and acute mania. The utmost mental disturbance of the children concerns the temper and the degree of intelligence.

It may be true, perhaps, that chorea tends in a measure to blunt the mental acuteness ; but in judging of this we are to remember that the instruments of intelligence are themselves impaired, that failure in act tends to produce infirmity and distrust of will, and that the facial deformity of chorea often so disguises the natural expression that it is no longer a fair index of the mind. Added to all this, the motor disorder so far occupies the attention that it is difficult and irksome to direct it elsewhere.

Some authors have laid much stress upon the independent variation of two separate elements of chorea, namely, the muscular restlessness and the ataxy. It is pointed out that children with but little restlessness may yet show marked want of muscular consensus, and the converse. It will suffice, in this place, to admit that the fact is so; its explanation must be sought when we come to consider the pathology of the affection.

As regards *the kind of person* most liable to chorea, independently of the question of age, or sex, or of predisposing diseases, it is enough to say that of those who have written with authority upon the subject some have chosen the dark children, and some the light. All have agreed, however, that susceptible and 'nervous' individuals are especially liable, although none believe that chorea is limited to these.[1] The attempt to connect anæmia with chorea I believe to depend on erroneous or too limited observation.[2]

The favourite age of chorea is between six and fourteen or fifteen. Its period of dangerous and sometimes fatal severity is from thirteen to about twenty-three. Of Sée's 191 cases, 151 fell between six and fifteen years of age; only 11 were under six, and 12 over twenty-one. In Dr. Pye Smith's[3] 136 cases, 106 were between six and fifteen. In 71 cases of Dr. Dickinson's, treated at the Hospital for Sick Children, 42 were under ten years.[4] In 177 consecutive cases under my own care, 96 were under that age.

It is thus necessary to amend Sydenham's statement, giving the limits of chorea between ten years old and puberty. It is rather from the period of second dentition to about twelve or thirteen that it prevails, and then suddenly declines. Yet it must be added that the most formidable examples of the affection occur at the

[1] See Appendix B, in reference to the large proportion of whooping cough in choreic subjects.

[2] It has been observed that choreic children in larger proportion than others have large pupils, but I know of no reason for this, and have no accurate data concerning it.

[3] See Guy's Hospital *Reports*, 1873.

[4] *Med.-Chir. Trans.*, vol. lix. p. 30.

time of puberty. If, indeed, such cases were eliminated, the actual mortality of the disease, small as it is, would be very greatly reduced.

Chorea occurs to *girls more than twice, but something less than three times, as often as to boys.*[1] This sex difference is the least among the little children and the greatest amongst the elder ones, but it never disappears. The statement that there is no sex disparity under nine years of age is certainly an error. The statistics of many authors upon this point are in substantial agreement. M. Sée, in 531 cases, had 393 females, and 138 males; a proportion of 2·8 to 1. Dr. Hughes has 73 females to 27 males; a proportion of 2·5 to 1. Dr. Dickinson, 50 to 21; a proportion of nearly 2·4 to 1. Dr. Peacock, 66 to 26; or 2·6 to 1. My own tables give 99 to 33—exactly 3 to 1—for the Children's Hospital; and 35 to 10, or 3·5 to 1, for the Westminster Hospital. That there is a somewhat less inequality in the younger children—yet no approach to equality—appears probable from the fact that of 21 children under eight years, of Dr. Dickinson's table, 13 were girls and 8 boys; while of 40 children under the same age of my own, 28 were girls and 12 boys. Of the exact proportion of the sexes at the age of puberty, I cannot speak; but there is undoubtedly a very large preponderance of young women. A severe form of chorea at the approach or completion of puberty in girls, is a not very uncommon occurrence; while the same thing in youths is certainly very rare.

Cases have been reported of chorea occurring to infants at the breast, and even at the hour of birth; but I know of none such.

We have yet to notice a form of the disorder, which, although slower, less varied, and more nearly rhythmical than ordinary chorea, may properly be called by that name. In the very *rare occurrence of chorea for the first time in old age*, the patients are usually weakened in intellect or actually demented. Less rare, but still uncommon, is the persistence into adult life of a chorea

[1] See Appendix B.

that began in childhood ; here, too, there is commonly some degree of mental impairment. Both these forms of the disorder may be regarded as incurable. Professor Charcot, who has called especial attention to senile chorea, has no anatomical pathology for it. He regards it as a merely emotional disease, and quotes examples from the Salpetrière Asylum to show its origin in distressing events and violent passions, as well as the mental feebleness that goes along with it.[1]

Along with this adult chorea, mention may here be made of the various muscular tricks and twitches acquired early in life, and which, as the common observation of everyone will admit, cease to be curable when youth has passed. There is hardly an individual of middle life to be met with who has not some habit of the kind, which only needs to be exaggerated or extended to be accounted chorea. These movement infirmities concern chiefly the face, head, and shoulders ; and the jerking or twitching of these parts is often strictly rhythmical.[2] The equality of the intervals is seen best when the individual is walking, by their leaving time always for the same number of steps. Such disorder is of course more or less noticeable according to its seat and extent, and is more readily accepted and overlooked in the old than in the young. There is another form of rhythmic movement which is intimately associated with hysteria and with young women, to which M. Charcot has given the name of 'rhythmic chorea.' In this affection, the arm and leg of one side may be alternately flexed and straightened[3] for a considerable period, or the head may be set shaking, and continue to move with constantly increasing rapidity, to the utter exhaustion of the patient. These

[1] 'On Chorea in Old People.' Lecture by Professor Charcot, *Medical Times and Gazette*, March 9, 1878. See also, in reference to post-mortem appearances, 'Cases of Choreic Convulsions in Advanced Age,' by Dr. Macleod.—*Journ. Mental Science*, July 1881. In Appendix A, case 12, is an example of chorea occurring to a man in middle life, intelligent and unemotional, and with no history of any previous attack.

[2] In reference to the natural tendency of over-movement in adults to become rhythmical, see *Medical Times and Gazette*, Septembe 28, 1878.

[3] *British Medical Journal*, vol. i. p. 224.

latter examples of perverted movement are intimately connected with perverted mind, and belong properly to the subject of hysteria.

As regards *the geographical distribution of chorea*, although we have no statistics to offer, it is known that the prevalence of the disorder varies very greatly in different parts of the world. Over the continent of Europe, or, so far at least as medical observation extends, chorea is nowhere very uncommon. It is a familiar disorder, at all events, in France, Germany, Austria, Italy, and European Russia, as well as in the United States of America. But there are other quarters of the globe where it is believed to be far less common. In Northern India I am informed it is very rarely met with, and in Bombay, I learn from a Parsee gentleman, a student of the Grant Medical College, that in the Jamsetjee Hospital for natives, where there are 500 beds, he saw, during three years' attendance, only a single case. Dr. Hughlings Jackson mentions, on the authority of an African medical man, that the affection is very rare among negroes. Dr. Livingstone makes no mention of chorea amongst the diseases he encountered during his travels. It is curious to notice that in countries where extravagant movements and contortions are practised in connection with religious rites, this movement disturbance of childhood, which takes its popular name from a mediæval superstition similarly allied to religion, should be rare.[1]

There is no evidence to show that chorea as such is hereditary ; yet, inasmuch as the temperament which exhibits it most is often inherited, it is probable that in certain families the affection should appear with unusual frequency in successive generations.

To sum up, then, the ascertained facts in regard to chorea ; we find its favourite time of life included between the time of

[1] How far chorea may be influenced by *social position* is a question of much interest, but also of much difficulty. I believe the fact to be that chorea as a *fully developed and recognised disease* is very much commoner with the poor, while among the well-to-do we have as many or more examples of *commencing* chorea, which due care and timely relief succeed in arresting at that stage. We must speak of this presently.

second dentition and that of puberty; its favourite sex is the female; the temperament that invites it most is the sensitive and emotional; it is apt to increase in severity as it decreases in frequency, little children suffering quite commonly, yet hardly ever with a fatal result, whilst of the few instances of adult chorea a notable proportion have died. Further, the disorder is but little if at all hereditary, and more common in highly civilised countries than in other parts of the world. So much is certain; what is to follow is to some extent involved in controversy. The exciting causes of chorea, its clinical and pathological associations, common sequelæ and modes of progress or of cure, furnish so much material out of which every student of the disorder would obtain a sanction for his own conceptions as to its real nature. It is impossible to proceed with the further study of the subject free from the bias of some hypothesis or other which will interpret and select facts which are equivocal in its own interest. I shall endeavour in this place to give the commonly received opinions upon the points just enumerated, and with this to conclude a general account of the clinical aspect of the affection which shall be free as far as possible from matters of speculation and difference.

Be the exciting cause of chorea what it may, there is commonly a *distinct interval between cause and effect.* It is probable that such interval is really shorter than it appears, inasmuch as the disorder is seldom observed at its very commencement. Dr. Hughes[1] made special inquiry into this point in 26 cases. He found that in 13, or exactly half of these, this interval was o not more than a week, in 2 of the 26 it was between one and two weeks, in 3 it exceeded two weeks, and in 8 there was no appreciable interval. Thus in all but five the attack followed its presumed cause either immediately or within a week, the latter being the commoner event.

The *immediate exciting causes of chorea* are variously stated by different authors. It is certain and universally admitted that

[1] Guy's Hospital *Reports*, 1846, p. 380.

fright and mental disturbance are prominent amongst these causes. Certain also that various kinds of pain, rheumatic and other, headache, joint pains, and the like, precede and accompany the affection whether as cause or not. Again, the convalescence of children from acute disease, scarlatina, measles, rheumatism, is sometimes disturbed by the appearance of chorea. This liability seems to attend especially the recovery from acute rheumatism. But in what proportion of cases this occurs, and whether or not this liability holds good apart from heart disease, are matters of controversy to be discussed presently along with the whole question of the relationship between chorea and rheumatism. It may be stated, however, as amongst the facts which are beyond dispute, that between chorea and heart disease, whether rheumatic or not, there is during childhood a distinct connection. There remain a not inconsiderable number of cases whose immediate origin is uncertain, where there has been neither rheumatism nor heart affection, nor acute disease. No hypothesis as to the pathology of chorea can be accepted which does not take account of this class. A child is at first supposed to be careless or awkward, and presently is discovered to be choreic. The affection in this kind is often prolonged but seldom violent. We may thus recognise, without however comprehending chorea in its entirety, three degrees of the affection: First, the obstinate, but not severe muscular restlessness of little children, of very obscure origin, gaining little by treatment but recovering at length as it were spontaneously. Secondly, the severe and sometimes fatal chorea of puberty, due often to some obvious mental disturbance, and, in the case of girls at least, never with certainty separable from some such cause. Thirdly, the rare and incurable chorea of the adult, distinct in many respects from the childish affection, being more spasmodic, rhythmical and uniform, and having no connection whatever, as I believe, with heart disease. If we add to these a small but distinct class of cases curiously associated with acute rheumatism and endo- and pericarditis, very early assuming

the form of uncontrollable and often fatal spasm, we shall have embraced the chief varieties of the disease. To these points we shall presently return.

The *progress of chorea* is very irregular and its duration uncertain. Recovery is commonly gradual and apt to be interrupted. In some rare cases it has suddenly disappeared after mental shock. The rule of the affection according to my own observation is this ; that after a longer or shorter duration signs of improvement will commence, but that this amendment is not continuous, but subject to interruption and relapse. Slight trouble or excitement, or physical pain, the sight of other children suffering similarly, or temporary indisposition short of serious illness, are among the common causes of such relapse. But when recovery has reached a certain point it becomes henceforth rapid and continuous. It must be added that when chorea first comes under formal medical treatment it commonly gets worse, while, apart from disturbing causes, rest in bed, especially with the younger children, will commonly make it better.

The *duration of chorea* is too variable to admit of any general statement. Dr. Hillier and Drs. Gray and Tuckwell have fixed ten weeks as the average. It is seldom recovered from under six weeks, and, as has been already mentioned, in the case of very young children, it may linger for many months. It is not easy indeed in any individual instance to assign its precise limits, for it is seldom discovered quite at the first, and, owing to the nature of its subjects, it declines very gradually, not into absolute steadiness, but into such comparative quiet as still leaves the shadow of the old disorder. Honest observers, therefore, of the very same series of cases of chorea, might differ widely in their account of its duration.

To these statements regarding the progress and duration of chorea, something must be added in regard to occasional and exceptional symptoms. One curious and rare incident of the affection is the intervention of general or localised muscular weakness. The

chorea, that is to say, will moderate in respect of the violence of the movements, but there will supervene, along with the failure of muscular consensus, a distinct *loss of power on the part of individual muscles*, the general health meanwhile being maintained, and the bodily weight even increasing. Other things being equal, such chorea is not more dangerous, although it is longer than the ordinary form. In such cases, I think, the decreasing violence of the movement as an augury for good is hardly lessened by the observation of this particular symptom.

It is not uncommon for *chorea to recur*, although two, and still more three recurrences are rare. M. Sée had 37 recurrences among 158 cases. Dr. Dickinson in 71 cases has 18 second attacks, 4 third attacks, and 1 fourth attack. In my own 177 there are 38 which were second attacks, 10 third attacks, 3 fourth attacks, and 1 in which the precise number of attacks was uncertain.

In the *chorea of pregnancy and of puberty* it is common to find that the same disturbance has happened in childhood. Thus Dr. Barnes [1] in 66 choreas in pregnancy had 14 of this kind. My belief is that the severe chorea of puberty would also show a large proportion who had suffered earlier attacks, but the numbers at hand are insufficient for the purpose of proving this.

Heart affection in connection with chorea will be considered in a future chapter. I would confine myself now to a simple statement of what passes current upon this matter, as well as of what I shall presently attempt to prove. It is universally admitted that a systolic apex murmur is a common symptom in the chorea of childhood. Ziemssen speaks of this murmur as of purely functional origin, due, as he believes, to the action of the capillary muscles. Upon *à priori* grounds he considers that change in the valvular sound 'is more likely in chorea than in any other affection.' He asserts (I believe with perfect accuracy) that there is commonly 'no increase in the second pulmonary sound, no enlargement of the right ventricle, nor any other sign of increased tension demon-

[1] *Obstetrical Trans.*, vol. x. p. 147.

strable in the system of the pulmonary artery.'[1] At the same time he recognises 'the residual consequences of an old endocarditis' as sometimes contributing to produce murmur. It is occasionally hard to decide, according to the same authority, whether the murmur be anatomical or purely functional, and he instances anæmia, chlorosis, and acute rheumatism as exhibiting 'functional disturbances of the mitral quite as obscure as does chorea.' In all this I venture to concur, and still further would desire to recognise a 'chorea of the heart,' which Ziemssen describes without adopting the description,[2] consisting of 'irregularity of rhythm audible while the disease is at its height, but neither before nor after.'

The opinion I have been led to form upon this subject, and which I shall seek to justify presently, is as follows:—Accepting the views just stated as to the frequency and character of cardiac murmur and the absence of signs indicating enlargement or change of any kind in the heart cavities, I would insist, too, upon the cardiac symptoms of chorea as being special and unique, a part of the disease itself, coming and going with it, and exhibiting in many instances not only murmur, but marked unevenness of rhythm and even irregularity of action. This cardiac implication is not more frequent in severe than in moderate chorea, and follows no other rule than that it is more common in children than in adults. The irregularity of the heart is in no direct relation to that of the respiration, and seldom gives rise to any subjective symptom. Such description applies only to that functional disturbance of the heart to which all young choreic subjects are liable, although many escape it. We are to remember at the same time that there is at least this connection between chorea and endocarditis, that the disturbance of the heart which begins with an attack of chorea,

[1] *Loc. cit.* p. 440.

[2] Ziemssen speaks of arhythmia of the heart as 'certainly very rare,' and quotes Romberg's assertion that he could discover no abnormal variation in the movements of the heart in spite of continued observation. Accelerated action of the heart is the utmost he admits. These points will be found discussed in Chap. III.

and exhibits at first no more than uneven or irregular rhythm, may presently develop a mitral murmur, without trace of rheumatism past or present, a murmur which shall not only present all the physical signs of endocarditis, but which after death shall be found to depend upon fibrinous deposit.

It has been mentioned already that the chorea of later life, and especially that of puberty, is commonly associated with more or less of nervous exaltation. In young women *hysteria is often combined with it.* The two affections may occur alternately, or they may be so intimately blended that the one name seems as appropriate as the other. The same sort of sympathy is further illustrated by examples of choreic movement in girls being replaced by tremor or insensibility, or even prolonged immobility.[1] The loss of will control is further shown in a still rarer modification by Dr. Handfield Jones, who mentions a case where certain words escaped involuntarily, and to the evident mortification of the patient.[2]

Among the *rare associations of chorea* is delirium, rising in some instances to such violence as to assume the character of mania. This symptom will sometimes accompany, and sometimes alternate with, or replace chorea, reminding us of a similar conduct on the part of epilepsy. Such nervous implication is confined to the chorea of puberty, pregnancy, or early adult life, thus adding another distinctive feature to the disorder as seen at this period.[3]

[1] Dr. H. Jones, *Functional Nervous Diseases*, p. 362, sq. A child (aged six) has lately been under my care recovering from chorea, who exhibited remarkable fixity of attitude, inasmuch as that she would maintain for a considerable time any posture, however inconvenient, in which she was placed. Thus she would remain quite motionless with both arms extended and the head thrown back; and at ordinary times, although not actually cataleptic, was, to use Dr. Jones' words, 'unnaturally still,' even for an adult. Moreover, when set to walk she seemed to want spontaneity, would soon stop, and only after repeated halts and several biddings get round the table. Other similar examples are quoted in the *Medical Times and Gazette*, 'Motor Disorders,' October 19, 1878.

[2] The occurrence of painful points, or points painful upon pressure, ought probably to be mentioned in this place, but I have no observations of my own on the subject. See Ziemssen, *loc. cit.* p. 435.

[3] See further references to such cases in Chapter IV. A good example of the kind quoted by Dr. Bradbury, of Cambridge, will be found in the *British Medical*

It is not uncommon in the violent chorea of adults to find that whenever by a strong exertion of the will the overmovement is violently resisted, the effect of such effort presently appears in the form of emotional agitation. I have conversed with adult patients, who, after their recovery, still retained a vivid impression of the state of mind which they described as compelling them to surrender themselves as by a sort of choice to movement rather than emotion.

In evidence of the hysteric alliance of chorea, *its imitative tendency* is sometimes quoted. And that the disorder is sometimes spread in this way there can be no doubt. Thus Bucheteau [1] relates that in the course of five days after the admission into hospital of a girl suffering from most intense chorea, eight patients already in the ward contracted the disorder. Dr. West has observed instances of a similar contagion. It must be admitted, however, that this mode of conveyance is rare. In many instances, and probably in that just quoted, it is not so much that the disease is directly imitated as that it spreads by the intervention of terror produced by the sight of it.

From this aspect of chorea in association with various functional nervous disturbances, we might proceed to consider its connection with structural diseases of the brain and spinal cord. Chorea is sometimes followed by hemiplegia, sometimes it leaves a permanent contraction of the flexor muscles of the wrist, and sometimes such oscillatory movement as is met with in disseminated sclerosis. Again, convulsion or tremor has been seen to alternate with chorea, and epilepsy [2] has both preceded and followed it. Of such phe-

Journal, June 10, 1876, the patient being a young man, and the chorea, which was ultimately recovered from, originating in fright.

[1] Dr. H. Jones, *loc. cit.* p. 350.

[2] Out of a large number of cases of epilepsy, Dr. Gowers found but twelve who had had chorea, and in only four of those did the fits begin at the time of the chorea. In eight cases epilepsy existed before the chorea. In the small number of instances where the fits immediately succeeded the chorea, he thinks it probable that 'the impaired nutrition of the motor centres may have left a predisposition to further disturbance.' I think, on the contrary, that the exceptional character of

nomena we shall speak more particularly presently. What I have to insist upon here is that they are all in the highest degree exceptional. We are absolutely forbidden therefore from attributing any such meaning to them as they might justly bear were they of common occurrence in chorea. What is called 'choreic hemiplegia' is not only very rare, it is seldom complete or enduring. In some alleged instances of the kind, the evidence of chorea is very defective, while in others it is evident that the preceding affection was not chorea but tremor.[1] A form of paralysis far commoner than hemiplegia is that temporary loss of power on the part of a particular group of muscles which has been just noticed. The occurrence of such lesion can never escape notice, for it serves in a marked manner to disfigure the characteristic aspect of chorea.

Apart from such exceptional instances, what we have to consider now,—what we see ninety times out of a hundred, is the condition I began by describing, a restlessness of the limbs and faces of chil-

the occurrence argues strongly against any such predisposition. See Gower's 'Lectures on Epilepsy,' *Lancet*, vol. i. 1880, p. 355.

[1] In the three cases of choreic hemiplegia related by Dr. Todd (*Nervous Diseases*, p. 312, *et seq.*) and often quoted, the chorea in the first (a boy of nine) was not 'hemichorea,' nor was the paralysis complete; the patient was nearly well in eight days. The second was a girl of eighteen, who after right-sided chorea appeared uneasy in her right foot, had feeble grasp with that hand, and sensations of numbness in the right arm and shoulder, symptoms not unusual in one of her age and sex. The third case is that of a child of five taken 'with a trembling motion of both arms,' suddenly followed by right hemiplegia, observed only by the mother, lasting only two or three days, and succeeded by right-sided chorea. This last case, therefore, is the only one in point as showing a connection between chorea and hemiplegia of the same side.

As contrasting with hemiplegia, some examples of my own may be here shortly quoted, illustrating that temporary or partial loss of power which is not very uncommon in chorea. A boy aged nine, with very chronic chorea, is observed one morning when being washed to have the left shoulder drooping, and is found on examination to have lost power incompletely (and, as it proved, very temporarily) of the muscles that raise the shoulder. A girl aged about ten with severe chorea is unable to extend the right hand when the arm is raised. As an example of more permanent changes, a girl of six gets in addition to her chorea habitual flexure of one arm, with tendency to tremor therein. Another girl, aged ten, after many months of chorea, develops while under observation such contractions of the flexors of the left arm as to keep the hand firmly bent at the wrist, after the manner of so-called *athetosis*.

dren easily borne and not affecting the health ; involuntary more or less, changeful with the emotions, apt to influence the action and rhythm of the heart ; moving the upper limbs in preference to the lower, sometimes limited to a particular set of muscles, but otherwise seldom strictly confined to one side of the body ; liable to recur during the period of childhood and youth, while after that time it is often replaced by hysteria, which mixes with it more and more intimately as puberty is approached ; an affection of very uncertain duration and uneven progress, yet almost always (in the case of children) recovering completely without entailing any further disorder or infirmity. Such, in fact, is a general sketch of chorea, the object of the present chapter. Its exceptional phenomena are neither to be overlooked nor overestimated, and will be considered in their place.

In what follows we are to examine in detail the various relationships and asserted modes of origin of chorea ; to consider the theories that have been propounded to explain it, and to offer for acceptance some such hypothesis in regard to its pathology as an unbiassed review of the facts may seem to justify.

CHAPTER II.

THE CONNECTION OF RHEUMATISM WITH CHOREA.

Analysis of 177 cases of chorea—Comparison with other statistics—Conclusions in reference to rheumatic connection, (1) from statistics, (2) from general considerations.

In Appendix B will be found two series of cases of chorea, the one consisting of 132 examples furnished by the Hospital for Sick Children, the other of 45 furnished by the Westminster Hospital. The question of the rheumatic origin and associations of chorea was made a special object of inquiry in the first series, where the cases are taken consecutively, with no sort of selection, and where, moreover, the entries are not mine, but those of successive Medical Registrars at the Hospital for Sick Children during the five years over which the record extends. For these reasons, although the two series tell substantially the same tale, I would direct the reader's attention more especially to the first and larger series. It will be seen, at the place just referred to, that the 132 cases are arranged in three consecutive sets of 51, 49, and 32 respectively; and, although there is no real break between one series and the next, it may give the clearest impression of the question at issue if the facts in regard to rheumatism are stated separately for each of the three. It appears thus, that, of the 51 cases (14 boys and 37 girls), acute rheumatism was in the history of only 1, and rheumatism in the history of only 6—doubtfully as regards 3, if not 4, of these; in 3 the facts could not be ascertained. Of the second series of 49 cases (13 boys and 36 girls), 4 had had acute rheumatism (1 of them

shortly before the choreic attack) ; 6 had probably had rheumatism ; 2 were doubtful ; and in 1 the facts were not known. Of the third series of 32 cases (6 boys and 26 girls), 2 had had rheumatic fever ; 7 rheumatic pains ; and 1 was uncertain. Thus, the whole 132 cases give 7 who have had rheumatic fever ; 14 to 16 who have had pains probably rheumatic ; 6 who were doubtful, and 5 where the facts were not ascertained.

The precise accuracy of this account cannot of course be guaranteed ; but if the facts be stated in somewhat different form, we may assert, precisely and certainly, that of the 51 cases of the first series there are 39 with positive evidence against any rheumatic connection whatever ; of the 49 of the second series, 35 with such evidence ; and of the 32 of the third series, 22—97 cases, that is to say out of 132, were free from any rheumatic association. In other words, chorea has nothing to do with rheumatism in three-fourths of the cases.

And when we come to inquire what is the *nature* of the association, it will appear that of this small proportion of cases having a rheumatic history there are very few where the chorea springs from the rheumatism in such manner as to make the one seem to be the direct consequence of the other. In perhaps 6 out of the 132, or 1 in 22—2 of these 6 being cases of acute rheumatism—this direct relationship may appear to exist.

Allowing a considerable margin for error, the conclusion to be drawn from these numbers is not doubtful. It would appear from them, so far as children are concerned, that chorea in the great majority of cases, say in three-fourths of them, is apart from rheumatism altogether ; and further, that chorea, as the direct and immediate consequence of rheumatism, is a rare event. It will not be denied that 132 cases, taken consecutively, and where pains were taken in regard to this particular point, afford weighty material to be put in evidence upon the question at issue. But the particular conclusion arrived at may be resisted on several grounds. It may be said that a too rigid definition of rheumatism has been adopted,

which excludes proper examples of it. The symptoms of rheumatism, it will perhaps be urged, occur to children with special modification, and are, on that account, easily overlooked. It may be added that these statistics are in direct conflict with others, the balance of testimony being, on the whole, in favour of an intimate connection between chorea and rheumatism.

There is a further contention which will be best considered separately. It is that of some physicians who, while admitting that rheumatism is hardly excessive among choreic children, yet still maintain the rheumatic association in virtue of their kindred. I would say a word or two upon each of these points.

As regards *the definition of rheumatism*, the account of the patients has usually been accepted. In some few cases there have been joint pains of no specified character, without redness, or swelling, or definite illness. In these, the occurrence of rheumatism was held to be doubtful, and the cases are so recorded, and have been included in the above enumeration.

As to *the peculiar character of childish rheumatism*, it is true that many authorities lay stress upon the evanescent character of the joint affection in these subjects, and the great frequency with which the heart is attacked.[1] Accepting this observation without reserve, it seems obvious to remark that the original assertion of the connection between chorea and rheumatism had reference to the limb pains and joint inflammation of the latter disease as we see it at all ages more or less. If this latent form of rheumatism is now to be substituted and the absence of any history of rheumatism to be explained accordingly, we not only make all former statistics worthless, but virtually admit, by raising this new plea, that the original assertion as to the connection

[1] Side by side with the statement that the joint implication of rheumatism in childhood may be slight and evanescent, may be put the observations of M. Bouilly upon a febrile condition of children involving the joints called by him 'the fever of growth,' and which, although unconnected with rheumatism, would in all probability be mistaken for it. See Bouilly, *Journal de Médecine et de Chirurgie*, December 1879.

between chorea and rheumatism has broken down. And, moreover, if it be by inflammation of the heart and pericardium rather than by joint pains that childish rheumatism shows itself, it will be safest to connect chorea, not with the rheumatic poison (which is a vague thing at best), but with endocarditis and pericarditis.[1] It must be remembered, besides, that the more we succeed in making rheumatism a common disease amongst children, the more we must expect to meet with examples of it in any collection of subjects whatever, whether of chorea or any other affection, unless, indeed, which no one pretends, the one disorder excludes the other.

The statement that *the results just quoted are at variance with general testimony*, and that, upon the whole, the rheumatic connection of chorea is supported by statistics, is one which need not be accepted immediately. Of continental opinion it may be enough to say that the French and the Germans are very much at issue upon this point. Trousseau, as is well known, always insisted upon the intimate union of the two affections, reckoning, however, as evidence of rheumatism any traces of by-past endocarditis. M. Sée finds chorea and rheumatism coinciding in 61 out of 128 cases; in only 32 of these, however, or one-fourth, were the rheumatic signs decisive. M. Roger has disposed of the question summarily, and in language which renders the labour of taking percentages superfluous. He believes that 'chorea and rheumatism are one and the same affection under two forms.' On the other hand, Romberg lays no stress upon rheumatism as allied to chorea, and declares his dissent from the views of English writers in this respect; while Steiner, of Prague, records 252 cases, only 4 of which occurred during the course of acute rheumatism.

[1] Senator, in his lengthy monograph upon rheumatism, alludes to the risk of heart disease amongst the young, and adds: 'This' (i.e. the heart disease, and not the rheumatism) 'is not unfrequently followed by chorea, especially when the mitral is the affected valve.' This one sentence contains the only allusion to chorea. So little do the historians of rheumatism respond to those of chorea upon this subject.—Ziemssen, vol. xvi. p. 57.

The most recent statistics of our own upon this subject are those of Dr. Dickinson, in vol. lix. 'Medico-Chirurgical Trans.'; of Dr. Owen, in the 'St. George's Hospital Reports,' vol. ix.; and of Dr. Peacock, in the eighth volume of the 'St. Thomas's Reports.' There are also the often-quoted cases of Dr. Hughes in the 'Guy's Hospital Reports.' These last, however, owing to their date, and other circumstances which I shall mention presently, seem to require separate consideration. Dr. Dickinson's cases refer to the same hospital, and include the same ages as my own (from two to twelve). In 71 cases, as many as 10 are doubtful (they are *marked* as 9, but a tenth case is described in the same terms) as to their antecedents. There remain 61, in 42 of whom rheumatism is absent; 19, at the most, had rheumatism somewhere in their history, and in 7 of these it immediately preceded the chorea. Two hundred and three cases (these and my own) thus furnish 139 wholly free from rheumatism, 21 without history, and perhaps 43 who had rheumatism somewhere in their lives, in 12 or 13 of whom this affection might be regarded as cause, or part cause, of the chorea.

These numbers refer to a child's hospital where the utmost age is twelve. General hospitals, where there is no such age limitation, may be expected to yield a larger proportion of rheumatism, inasmuch as with the larger aggregate of years there is more time for accumulating disease. In two tables of the model medical reports of Dr. Owen, of St. George's Hospital, will be found a collection of 50 cases, 22 of whom were over twelve years old. Of these 50, 34 were without rheumatism, 3 were too doubtful to be reckoned, and 13 had rheumatism in their histories, in 4 of these last immediately preceding, and presumably causing, the chorea. Adding, therefore, this third list, we get 253 cases, which yield 173 wholly free from rheumatism, 24 doubtful, and 56 who had rheumatism somewhere in their lives, of whom 16 or 17 had the rheumatism in immediate connection with the chorea.

In Dr. Peacock's tables, dealing with 92 cases, only a portion of whom were children, there are as many as 24 or 26 who had had rheumatism at some time or other, the rheumatic symptoms having immediately preceded the chorea in 7; 53 or 54 were known not to have had rheumatism; and the remainder are variously accounted for.[1] The percentage of rheumatism, therefore, is higher in these than in the other tables, yet still the number of the rheumatic is only just over a fourth of the whole.

There remain for consideration the statistics of Dr. Hughes, in the 'Guy's Hospital Reports' of 1846 and 1855. It is necessary to observe of these tables that they were not constructed exclusively from cases under the author's own observation, and that there is no constant purpose pervading them. In many instances rheumatism is not even alluded to. The first series, indeed, is founded upon the supposition, no longer tenable, that the existence of cardiac murmur deposes directly in favour of past rheumatism. We read, therefore, that while 8 cases only had their origin, 'more or less directly,' in rheumatism, 'there were only 15, out of the 104 where inquiries were made on the subject, in which the patients were *both* free from cardiac murmur *and* from a previous attack of rheumatism.' Such a statement would not differ very widely from the general experience. Some sort of cardiac disturbance is very common with the younger children. This observation, however, can no longer be accepted as determining the question of the proportion of rheumatism. In Dr. Hughes' second series of cases, rheumatism finds place in the notes of but 58 out of 209. It so happens that in this casual mention the positive fact of its presence is noted 30 times, and the negative fact of its absence 28 times, or about half and half. But, it is surely unfair to suppose that these numbers at all represent the actual proportion of rheumatism in the whole body

[1] From the elaborate character of Dr. Peacock's report I find it difficult to summarise it, and would refer the reader to the paper itself, which deals with many other points of interest besides the one here discussed.

of cases. A small number of examples thus brought together, with a view to illustrate the rheumatic origin of chorea, at a time when such origin is devoutly believed in, will be certain to give undue prominence to that connection. It is only by taking a number of examples consecutively, over a long period, that this disturbing element of choice can be eliminated. Where this is done, the results, as I have shown, are not very various, and non-rheumatic chorea is exhibited in overwhelming excess of the rheumatic, the percentage of the former varying from 75 to 85.

But it is said the rheumatism with which chorea is associated appears in the families rather than in the patients themselves. It is impossible, of course, to test this position with any accuracy. Rheumatism is to be found in every family in the kingdom if we do but seek far enough, nor can anyone say what is the proper normal amount of it. I have noted the point in 73 of my own cases, restricting inquiry to the immediate family, that is, to parents, brothers, and sisters. The result is as follows : Rheumatism is in the family history in 19 out of the 73 ; 9 of these 19 have themselves had rheumatism, and 10 have not. In 1 or perhaps 2 of these 9 personally rheumatic patients rheumatism was probably the direct cause of the chorea, and in 1 rheumatic fever was the direct cause. I do not quote these figures as conclusive, or even wholly reliable. So far as they go, and are accepted, they do not confirm the assertion that choreic children have, as a rule, near relatives who are rheumatic. We may well hesitate to believe a doctrine to which the statistics of rheumatism give no support. At any rate, if rheumatic parents transmit their morbid peculiarities to their children, they may be trusted to transmit first of all a liability to rheumatism. We are thus brought back to consider the question as regards the children themselves, since it is certain that if these are choreic in excess, they must still more be rheumatic in excess.

There is reason to believe, from the figures that have been quoted, allowing sufficient room for error :—

1st. That the proportion of chorea showing antecedent rheumatism does not exceed 25 per cent. of the whole number where children up to twelve years old are taken (viz. 20 per cent. in my own 132, and at the rate of something under 26 per cent. in Dr. Dickinson's 71); and somewhere between 26 and 28 per cent. where there is no age limitation (viz. 26 per cent. in St. George's 50, and 26 or 28 per cent. in Dr. Peacock's 92).

2nd. That the number of instances where rheumatism, in whatever form, is *immediately* connected with the chorea is very small; being 4 per cent. in my own cases, 7 in Dr. Dickinson's, and from 7 to 8 in Dr. Peacock's and in Dr. Owen's (St. George's).

3rd. That in the great majority of cases of chorea occurring in children supposed to have been rheumatic, the immediate exciting cause of the chorea is no other than that which suffices to produce the same affection in other children who have never been rheumatic.

It is obvious that by no method of argument can these conclusions be made to tell in favour of that *intimate* connection between chorea and rheumatism which some contend for. Let us say, for example, that 100 instances of chorea yield 25 with a history of antecedent rheumatism. Of these there must be a certain number representing the proper proportion of rheumatic subjects, which we might expect to find in 100 individuals. What this number should be we know not. Suppose that, on an average, only 5 per cent. of our countrymen get rheumatism in childhood. We have then 20 out of 100 choreic patients charged with rheumatism in excess of the proper number. But physical pain is a well-recognised cause of chorea, so that of the cases that arise immediately out of rheumatism (from 5 to 8 per cent., as we have seen), some may be accounted for, not because of the rheumatism as such, but because of the pain that attends rheumatism. This would still further reduce the number.

The excess of rheumatism, then, in chorea would seem to be represented, at the utmost, by something between 15 and 20 per

cent.—an excess too small to be adduced in support of any *intimate* alliance between the two, but nevertheless needing to be accounted for somehow. The question, in fact, comes to this: whether to believe that rheumatism confers this extra liability to suffer from chorea, not immediately, but at some future and it may be distant period; or else to believe that the excess of rheumatism is only apparent, and due to the fact that rheumatism shares with chorea both heart disturbance and limb pains, so that symptoms which properly belong to the one affection are easily attributed to the other. If the first supposition be adopted it will be necessary to insist (for here the evidence of statistics is decisive)—first, that the rheumatism which predisposes to chorea is seldom connected with it in point of time, a clear interval occurring between the disappearance of the cause and the arrival of the effect; and secondly that the rheumatic children who become choreic require the very same immediate incentive to the disorder as do other children—namely, alarm or mental excitement or nervous shock. If the second supposition be adopted, the prevalent belief in the connexion of rheumatism and chorea depends upon faulty observation and is sufficiently explained by the circumstances; while in the lessening proportion of rheumatism in our later statistics we see the operation of that still recent knowledge which discriminates between the heart affection of chorea and that of bygone rheumatism.

But it is not by statistics alone that this question must be settled, nor do the bare figures give a complete representation of the relationship of chorea to acute and chronic rheumatism respectively. With the special liability of choreic children to joint and limb pain as well as to valvular heart murmur, we may well accept a much larger proportion of rheumatism than is actually credited to chorea without becoming convinced of any real connection between them. The prevalence of such a belief is easily accounted for without assuming its truth. The case is somewhat different with acute rheumatism. The instances in

which severe and sometimes fatal chorea arises in the course of this disease are so striking and so similar that notwithstanding the comparative rarity of the conjunction it is difficult to resist the conclusion that the one affection actually gives rise to the other. Such examples, although too few to affect perceptibly statistical tables, are yet numerous in the aggregate. If, indeed, we were to exclude the commonest form of chorea and look only to adult patients the proportion of instances where chorea occurred as the immediate sequel of acute articular rheumatism with endocarditis would not be excessively small.[1] And not only so, but the sequence may be different, and in the course of chorea, or immediately on recovery from it an attack of acute rheumatism may supervene. On the other hand, and lest any should think that this connection is other than rare, let it be considered that in a disease so familiar to hospitals as acute rheumatism many physicians of experience have never seen this association, no one would think of anticipating it, and the voluminous records of rheumatism hardly make mention of it. Further material will be adduced in the course of this treatise, upon which the reader will be invited to form his own judgment upon this matter; in the meanwhile, the following conclusions seem to be justified by a full consideration of the facts :—

1st. Acute rheumatism with heart implication, although rare in the history of chorea, occurs in such association with it as to justify the assumption of some direct relationship. The combination, however, is so exceptional that it hardly affects the question of the origin of ordinary childish chorea.

2nd. Chronic or subacute rheumatism, although mentioned

[1] Mention may be made in this place of 22 cases of chorea recorded by myself many years ago, when Medical Registrar at St. George's Hospital, and not entered elsewhere in this book, having as many as three examples of the connection we are discussing. One was a boy of nine, who got chorea when recovering from acute rheumatism with pericarditis; another was a girl of sixteen, who got acute rheumatism in the course of severe chorea; the third was a girl of ten, who had acute rheumatism and chorea concurrently.

in the histories of patients more often than the other, is so difficult of identification, so often disconnected as regards time, so seldom seen unequivocally in actual company with chorea, and so easily imputed upon insufficient grounds, that the asserted influence of the rheumatic diathesis, or indeed any real connexion between rheumatism and chorea cannot be established.

But there is more to be said in regard to those examples of chorea to which I have alluded as occurring in immediate connexion with *acute* rheumatism, and in virtue of which it may be necessary to admit that the one disease actually gives rise to the other. In most of these the subjects are not children, but young adults in whom violent and often fatal clonic convulsion (whether chorea or not) arises immediately out of acute articular rheumatism, or interrupts or may even precede it. Such symptoms cannot be dissociated from the other phenomena of the disease which they accompany. They furnish examples, along with those of acute delirium and the various forms of cerebral embolism, of the several nervous accidents to which the condition of the blood during acute rheumatic fever gives occasion. In their origin, therefore, no less than in their character and choice of subjects, these convulsions are to be kept distinct from the chronic disorder of childhood which we are now discussing.

It is not to the present purpose to notice other arguments of statistics which are opposed to this asserted connection. These are to be found, as I believe, in the time of life, the sex, and the geographical distribution of chorea and rheumatism respectively, as well as in the fact that while students of chorea are earnestly contending for an alliance of this kind, the students of rheumatism, with their far richer material and ready recognition of complications and sequelæ, give no encouragement to such proposals. The doctrine of the rheumatic origin of chorea, however, is too firmly rooted in this country to be much disturbed by such considerations. We no longer seek to verify this connection, but are rather occupied in constructing some plausible explanation of it. Mean-

while the two most prominent and unquestionable facts in regard to the causation of chorea pass unregarded : the fact that alarm or mental disquiet is its commonest, and, it may be, its constant cause, and the fact that female children are in overwhelming proportion its favourite subjects.

CHAPTER III.

THE HEART SYMPTOMS OF CHOREA.

Facts for explanation—The comparative frequency of heart disturbance in chorea of different ages—The heart symptoms referred to endocarditis—to a sympathy on the part of the heart with the muscular disorder—Difficulties in the way of both hypotheses—Conclusions.

It is now generally admitted that there are certain heart symptoms proper to chorea apart from those which are due to its association with acute rheumatism or with anæmia. It is admitted as well that cardiac apex murmur is, more often than was at first believed, the sign of a functional disorder on the part of the valvular apparatus ; the precise nature of this defective action has been in great measure elucidated, and it has been repeatedly shown both in chorea and other conditions that such murmurs are temporary and innocuous. With this double advance of knowledge, both in regard to the natural history of the disease in question, and the pathology of the heart, we may consider the cardiac symptoms of chorea from a new standpoint, with a clearer and more just apprehension than heretofore of the facts involved, and fuller and more definite material for their discussion. In what is to follow I propose to investigate the present state of opinion as to the nature and significance of the cardiac phenomena of chorea. To place such opinion side by side with the actual facts of the case, and upon this review, to consider whether by means of any existing hypothesis, or of any modification or combination of hypotheses, the question at issue finds reasonable solution.

The heart symptom of chorea chiefly discussed amongst us is systolic murmur. In regard to the rate and rhythm of the heart,

as well as the precise seat of the bruit, there are, as we shall see, doubts and differences ; but all observers allow that a soft systolic murmur is apt to arise in the course of chorea, independently of rheumatism or of anæmia, which is variable in tone, disappearing and reappearing, often influenced by posture and by exercise, most audible in the majority of instances at the left apex, productive of no sensation of its own, and indicated by no outward sign of disturbed circulation.[1] Between this cardiac murmur and the choreic restlessness there is no equality or parallelism. No particular manner or degree of mismovement, and no particular temperament of patient is especially liable to this heart affection. The choreic murmur comes and goes secretly and without notice, there is no recognisable law of its occurrence, and when auscultation has discovered it, neither treatment nor prognosis is greatly influenced by the discovery.

But while these symptoms on the part of the heart, in their physical characters, limited duration and freedom from injurious consequences, remind us most of the so-called functional murmurs, yet they have a near relationship to substantive disease. This is not matter of inference, but of direct observation. There is no fact of chorea better established than this : that in the majority of fatal cases—dying either in the course of chorea or shortly afterwards—a fibrinous bead-like fringe is found edging the mitral valve, and occasionally the aortic valve also.[2] That this condition is the effect rather than the cause of the chorea, we are compelled to assume, in the numerous instances where murmur has gradually developed in the course of the muscular disorder. There are others, however, and especially those which arise out of acute rheumatism (be they few or many), where the sequence is different,

[1] Such is the general description. Dr. Walshe, however, insists upon the regularity of action, and Dr. George Balfour asserts that the murmur 'while it lasts is constant and unchanging.' See Walshe, *Diseases of Heart*, p. 89 ; Balfour, *Diseases of Heart*, p. 166.

[2] 'Pathology of Chorea,' Dickinson, *Med.-Chir. Trans.*, vol. lix. See Chap. IV. 'On Fatal Cases of Chorea.'

and the cardiac murmur, from immediately preceding the chorea, may be taken to indicate an endocarditis which is certainly not the consequence and may possibly be the direct cause of the chorea.

But although endocarditis, upon this showing, seems to be connected with chorea in a double relationship, both as its cause and its product, there are obvious difficulties in the way of admitting it at all. If endocarditis is really at the origin of chorea, why do the physical signs which should announce it so often lag behind, and why are they in themselves so equivocal and without the usual accompaniments and results of valve inflammation? If, on the contrary, endocarditis is not the origin of chorea, but arises out of it, by what sort of agency is this accomplished, and why does not chorea, in virtue of this association, lay the foundation of organic heart disease as acute rheumatism does? Two conflicting doctrines are thus offered for our acceptance, neither of which we can wholly accept, and neither wholly reject. It is certain on the one hand that cases of chorea which happen to die (whether from the severity of the disorder or otherwise) very commonly exhibit a fringing of recent lymph on the mitral valve; it is not less certain on the other that the non-fatal cases (that is of course the vast majority) very rarely exhibit valvular disease in later life. It is certain that both the auscultation signs and the subsequent history of chorea murmur correspond most closely with the dynamic murmur of young women; it is not less certain that chorea prefers children rather than young women, and shows after death the actual material of endocarditis.

Such are the difficulties which meet us at the outset in endeavouring to explain the cardiac symptoms of chorea, and it is obvious that the account I have just given in regard to these symptoms does not contain the key to the solution. There still remain, however, other factors of the problem, some which are differently interpreted by different observers, and some which perhaps have not as yet received their due share of notice. Thus, for example, there is the character of the heart's rhythm, which some

report to be irregular, and others undisturbed ; and there is the further question as to the mode of incidence of cardiac phenomena in chorea in respect of age. It may be that the discrepancies which appear at present in regard to the precise characters and relative frequency of heart disturbance will disappear when we come to compare patients of similar age. We know, for instance, that the liability to such disturbance is in no direct relation to the violence or the particular method of the choreic attack ; but we do not know that it has no direct relation to the age of the patient. Again, we know that choreic murmur may occur independently of any marked change in the cardiac rhythm ; but we do not know that this is so at all periods of life, or that disturbed rhythm is not the rule rather than the exception in young children.

In what follows I propose to consider the characters and the frequency of cardiac disturbances in young children as contrasted with those who are older ; to compare actual observations upon these points with the more general statement of authors ; and, by the help of this comparison, and the material it will require, to consider what hypothesis serves best to reconcile phenomena which at first sight seem to be conflicting. I take for this purpose, as before, the following :—

1. Dr. Dickinson's seventy-one cases (not 70 as stated) appended to his paper in the fifty-ninth volume of 'Medico-Chirurgical Transactions,' and referring to children treated at the Great Ormond Street Hospital.

2. One hundred and thirty-two cases of children treated by myself at the same hospital, but at a late stage of their disorder.

3. Thirty-nine cases of older children and young adults under my charge at the Westminster Hospital.[1]

4. Fifty cases similar to the last recorded by Dr. Owen in the ninth volume of the 'St. George's Hospital reports.'

[1] See Appendix B. The last six cases of the second series were added later, and are not reckoned above.

These four groups represent respectively, as will be seen more particularly in the sequel—

(1.) Young children from 2 to 12 observed at an early period of their disorder.

(2.) Young children of similar age observed at a later period of their disorder.

(3.) Older children with a few adults.

(4.) Older children, with a considerable proportion of young adults.

(1.) In Dr. Dickinson's table the number has to be reduced to 69, on account of two cases with the ages omitted. The children are all young. There is in fact but one, a girl, as old as 13, and but 3 as old as 12; the youngest is 3, the next youngest are two of 5; the ages most largely represented are 10 and 11 Taking the 69 cases, with a view to ascertain the incidence of heart affection at different ages, it will be found that of the 21 children who are 8 years old and under, only 4 are free from heart affection, 3 of these being of the age of 8; while of the 48 children above 8 years old, there are 17 free from heart disorder.[1] If, however, we state the numbers somewhat differently, classing the children of 8 amongst the elder ones, we shall then find that in 11 children under 8, there is but one free from heart affection, while in 58 of 8 years old and over, there are at least 19 free from any abnormality of cardiac action which can fairly be reckoned.[2] As regards irregularity, the 69 cases give 20 such examples, 12 of irregularity alone and 8 of irregularity together with murmur. Of the 21 children 8 years old and under, there are 5 with hearts

[1] Of the 17 children of eight and under having heart disturbance, as many as five had had acute rheumatism, to which therefore the heart condition might be referred. On the other hand, of the 31 children over eight having heart disturbance, as many as six had had previous attacks of chorea; to which period, therefore, rather than to the age recorded, the date of the heart disturbance might be referred.

[2] I have made these calculations from the tables themselves (to which I refer the reader), and they do not precisely correspond with Dr. Dickinson's own summary (on p. 34 of his paper). This latter, however, has reference not to the *ages* of the patients, but to the several *causes* of the chorea.

irregular only, and 3 with irregularity together with murmur. Of the 48 children over 8 years old, there are 7 with hearts irregular only, and 5 with irregularity together with murmur.

I take next a second group of children from the same hospital who were under my own charge, having been received from one or other of my colleagues. The ages are still between two and twelve, as in the first group, but the children come under observation at a later stage of their disorder; the great majority were chronic cases, some few were convalescent. The total number of these patients was 132 (appearing as 137, from 5 of them having been twice admitted). The age distribution is as follows:—

12 years old are only	2
11 years old are	24
9 and 10 years old	47
8 years old and under (36 of these being under eight)	59
	132

In the whole 132, 47 (more than a third) have heart murmur or irregularity. The 59 children of eight and under have 24 examples of heart disorder; the 72 children over eight have 23 such examples. In other words, the proportion of heart disturbance is about 40 per cent. in the younger children, and about 32 per cent. in the older ones.

Again, if we take the extremes of age in both directions, that is to say, if we compare the 26 children of eleven and twelve (the oldest we have to do with) with 36 who are *under* eight, we have 9 of the former having heart disorder against 16 of the latter, the actual percentage of heart disturbance being thus somewhat greater in the younger than in the older children. Of cardiac irregularity, as apart from murmur, not including mere unevenness of rhythm, there are but 9 examples, 6 of these referring to the little children.

These cases, therefore, representing the same ages as Dr. Dickinson's, but referring to a later stage of the affection, yield a

much diminished proportion of heart disturbance of whatever kind. It is a little over a third, whereas in the former table it is over two thirds. And what is still more remarkable, irregular action of the heart, largely represented in Dr. Dickinson's list, hardly appears in mine, and is almost confined to the younger patients.

It thus appears probable, taking these two tables as they stand, and comparing them together, first, that the heart affection of chorea is not less but more marked in early than in later childhood; secondly, that observation of the disorder at a late period discovers less heart disturbance than at an earlier, and especially that cardiac irregularity, a distinguishing feature of the chorea of early childhood, is found at the beginning rather than at the end of the attack.

Such, I say, are the conclusions to be drawn from a bare enumeration, and so long as we confine ourselves to children the majority of whom are not over ten, they are conclusions which need no correction. But when we enlarge the view and admit older children and adults; in other words, when we go from children's hospitals to general hospitals, we can no longer accept the mere figures without some attempt at adjustment on account of disparity of age. Thus, for example, all other things being equal, the greater the age the larger the proportion of heart disturbance independent altogether of chorea. We have to consider besides, that in comparing childhood with adolescence, in respect of the signs we are discussing, we have to encounter at the later period those functional murmurs (variously named, and attaching especially to young women) which, although they be altogether distinct from chorea as such, are not in practice distinguishable from it. Add to this that the older the patient the greater the probability that the chorea is not the first, but the second or the third attack, and the heart disturbance therefore but a revival of what has occurred in childhood, according to the well known law of the disorder to repeat itself. Such cases

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illustrate in fact the liability of *early* childhood in respect of heart sympathy: they are taken to illustrate the liability of the more advanced age at which the patient comes under notice. Again, some account must be taken of the previous occurrence of acute rheumatism, which is likely to appear in larger proportion in the histories of the older patients than of the younger, and to contribute its share of heart murmurs which are not choreic but rheumatic. It would be quite unfair, I say, to attempt the comparison we are now about without making allowance for discrepancies of this kind; without providing, that is to say, for the fact that the younger the child the more likely the heart disturbance to be part of the chorea, the older the child the more likely to be accidental or contributed. Moreover, in any exact computation as to the age-incidence of heart disturbance, it would be necessary of course to exclude from the comparison anæmic and chlorotic girls, as well as those who in earlier childhood had had either chorea or acute rheumatism. In the case of such children as we have been considering, all of them young, the correction necessary on this account would not amount to much, and we need not stay to make it; but in the case of the older patients we are now coming to, it makes a very wide difference. It would be altogether delusive and misleading to place the old and the young side by side with the view to an even comparison in respect of heart sympathy in chorea. Numerical equality between the two classes, or anything near an equality, would indicate, without doubt, that the heart was more often implicated in the chorea of the young than of the less young.

How the figures stand in these respects with older patients, and how large a correction is needed for such reasons as have been mentioned, will be seen from the examples of chorea which remain to be quoted, viz., the 39 of Westminster Hospital and the 50 of St. George's Hospital. In the 39 Westminster cases 19 are twelve years old or over, 5 of them being young women. In the 50 cases reported by Dr. Owen in the 'St. George's Hospital

Reports,' vol. ix., of two following years, as many as 27 are twelve years old and over, 11 of these being young women and 6 young men. We have thus in the four series of cases now rehearsed a constant rise in the ages of the patients. Dr. Dickinson's are the youngest, and the St. George's cases are by much the oldest, the Westminster series standing midway, and my own children's hospital cases differing from Dr. Dickinson's more in the duration of attack than in age of subject.

The 39 Westminster cases are distributed as follows :—

13 years and over (two being young women)	15
12 years old	4
11 years old	5
9 and ten years old	9
8 years old and under	6
	39

Of the whole number, 13 would have to be excluded, 5 on account of acute rheumatism at some earlier period, and 8 on account of previous attacks of chorea. The remaining 26 are made up of 19 who have no cardiac disorder, and 7 who have either murmur or irregularity. Of the 19 who have their hearts free, 15 are over eleven years old ; of the 7 who have cardiac murmur or irregularity, only 1 is over eleven.

In the two tables of cases of St. George's Hospital there are 15 examples of heart disturbance in 50 cases, 10 of these 15 are found among the 27 cases over twelve years old ; only 5 are found among the 23 cases under that age. Upon this showing, it would seem that cardiac symptoms in chorea are not more rare but much more common after twelve years old than before. Upon examination, however, of 10 individuals exhibiting heart murmur and over twelve years old, it appears that 4 of them have had previous attacks of chorea, 1 had pericarditis while in hospital, 1 developed murmur just after acute rheumatism, and 2 were weakly girls, aged fourteen and fifteen respectively. There are thus 8 of the 10 whose murmurs are accounted for apart from

chorea altogether. We get but too properly choreic murmurs in 27 choreic patients of ages ranging from thirteen to eighteen, as large a proportion, I am disposed to think, as will be commonly found at that period.

There is indeed considerable difficulty in fixing the time of life when the liability to heart disturbance in chorea finally ceases. The evidence already adduced shows, I think, that childhood is particularly liable to it, and that irregularity of rhythm distinguishes this earliest liability, whether with or without systolic murmur. It is also generally agreed that the rare chorea of advanced life has little connection with heart disturbance. But of the middle period our knowledge is far from precise. For it so happens that at the very time when, with the progress of development, the frequency of cardiac murmur in chorea is obviously lessening, there comes a period of life (and especially with young women) when the precise significance of the symptom we are discussing is hardly discoverable. Murmur may be choreic or (so-called) anæmic. It would seem impossible at such time to determine with any approach to certainty the proper liability of the heart in connection with chorea. We know only that so soon as this interval of obscurity has passed, and, with the completion of adult life, the indications furnished by the heart are again trustworthy, cardiac sympathy in chorea is hardly recognisable.

From the facts now adduced several conclusions seem to follow. Heart symptoms in chorea occur most frequently during a period which is included between two years of age and about seven or eight. The age of greatest liability to choreic heart disturbance thus nearly coincides with the age of greatest liability to chorea. Again the abrupt decline in the liability to chorea, which occurs at about fifteen, corresponds with a similar decline—if it be not rather a cessation—in the disposition of the heart to share in the disorder of the voluntary muscles.

It has been already observed that irregular cardiac action,

either alone or preceding, or accompanying the murmur, is a pretty frequent feature in the younger children of Dr. Dickinson's table. In my own children of similar age, but in a later stage of chorea, it is much less common. In the Westminster cases, where the patients are older, it is also rare, and in the St. George's cases, older still, irregularity hardly occurs. This particular symptom in the younger subjects is often the single sign of the heart's affection. I believe, although I cannot show by tables, that there are very few little children, if there be any, in any early stage of chorea, who do not exhibit a marked unevenness or inequality of cardiac rhythm. Such unevenness will sometimes develop into murmur and sometimes not, murmur which is almost always variable with the child's position, sometimes best heard over the pulmonary cartilage rather than at the apex,[1] apt to come and go, and often finally lost sight of before the chorea itself has disappeared. The second pulmonary sound is seldom accentuated or doubled.

These statistics in regard to the age-incidence of the heart symptoms of chorea enable us to render a fuller account than heretofore of the particular phenomena. Dr. Walshe's assertion that the cardiac action is regular must be limited to the older subjects, or to the later stages of the disorder. Dr. Bristowe's statement that the greater number of choreic patients have some cardiac defect, irregularity amongst the rest, must be qualified by adding that this large proportion refers to children, and that irregularity as a sign of heart disturbance is almost confined to them.

[1] The fact of mitral regurgitation being most audible in this situation, is well explained by Naunyn, as reported by Rosenstein (Ziemssen's *Cyclopæd.*, vol. vi. p. 122). He points out that the second intercostal space, close to the left edge of the sternum, coincides with the point of the left auricular appendix, which winds round the pulmonary artery and lies in front of it. Now with the abnormal current of blood flowing towards the auricle, we can easily understand, says Rosenstein, 'how the sound should be conducted to the spot mentioned better than towards the apex, more especially in cases where the appendix is long enough to lay its point against the anterior wall of the thorax.'

Thus the several factors of the problem with which we have to deal summarily stated are these :—

1. In the course of the chorea of childhood the heart is apt to become irregular or uneven, and its first sound to be followed by apex murmur, which is variable in pitch, influenced by posture, seldom audible in the axilla or at the angle of the scapula, and which disappears along with or shortly after the chorea, the heart and the circulation suffering no injury.

2. This liability on the part of the heart, to what, from its signs, would seem to be a functional disturbance, is independent of the violence or method of the chorea, but dependent upon the age of the patient, the younger children being the most, and the elder the least liable, while beyond childhood there is little if any liability of the kind.

3. These heart signs of chorea—acute rheumatism being excluded—give rise, as a general rule, to no symptoms whatever affecting the health or comfort of the child. They make no apparent difference to the prospects of recovery or the structural integrity of the heart. Nevertheless, choreic children having this murmur and happening to die, either with or shortly after recovery from chorea, very commonly exhibit a beading of recent lymph on the mitral valve.

Such, I say, are the chief statements which statistics seem to warrant. I will venture to add another, which, so far as I know, has never been statistically reckoned, but which no one will gainsay. It is, indeed, the most constant of all the heart symptoms of chorea, and met with at a later age than the rest. I mean the acceleration of the heart and pulse.[1]

[1] Ziemssen says 'cases of arhythmia are certainly very rare, and there is hardly anything published about it.' On the other hand, he regards acceleration of the action of the heart as common, and acceleration of the pulse as quite constant, although, as he believes (I am convinced erroneously), the bodily heat is not changed even in severe cases.—Ziemssen's *Cyclopæd.* art. *Chorea*, p. 436.

The heart symptoms mentioned in the text are not the only ones to be met with in chorea. I have heard presystolic murmur and both accentuation and doubling of the second sound, and this in cases where there was sufficient evidence

Now there are two hypotheses of the heart phenomena of chorea, each of which has special regard to certain of the facts just mentioned, although neither is able to reckon with them all. The two are in a sense mutually antagonistic, inasmuch as what the one rejects the other prefers. Both theories have their supporters in this country. The one asserts that the heart symptoms of chorea are due to endocarditis, the precise relationship of the muscular disorder to the valve inflammation being variously interpreted. The other asserts that the cardiac signs are intrinsic, a part of the chorea itself. That there is some evidence in favour of each of these views we have already seen. The task before us is to reconcile them.

To the belief that the heart murmur of chorea is due to endocarditis I know of nothing in the actual clinical symptoms that can be opposed. Our information in regard to the physical signs of endocarditis *per se* is, indeed, vague enough,[1] while the probability of its occurrence in chorea is directly favoured, as we have seen, by post-mortem evidence. The distinction between organic and functional heart murmurs, founded on hard and fast lines as to the transmission of the bruit, is of doubtful validity. 'A well-pronounced functional murmur,' says an excellent observer,[2] 'may be as diffused and transmitted as an organic.' 'A systolic apex murmur,' says Dr. Bristowe, 'is a positive proof of

that the heart disturbance was purely choreic. But I am not able to say at present to what ages these exceptional signs chiefly attach, or what is their proportion to the commoner symptoms.

[1] 'There are few diseases,' says Rosenstein, 'the presence of which is diagnosticated so arbitrarily as that of original acute and subacute endocarditis.' He proceeds to point out the necessity of 'proving the existence of *other symptoms in addition to the mere murmur*, especially intensified second sound in the pulmonary artery, the localisation of the murmur, or transverse hypertrophy of the cardiac volume.'—Rosenstein, art. *Endocarditis*, Ziemssen's *Cyclopæd.*, vol. vi. Dr. Bristowe says: 'If in the progress of any of those diseases of which endocarditis is a common complication, we detect a recent cardiac murmur, and *if further observation proves this to be a permanent phenomenon*, we cannot reasonably doubt that endocarditis is present.'—Bristowe, *Theory and Practice of Medicine*, 2nd edition, p. 522.

[2] Dr. Nixon in *Dublin Journal of Med. Science*, vol. iv. p. 575.

regurgitation.' We have, indeed, just as much evidence, so far as physical signs are concerned, of endocarditis in the course of chorea as we have of it in many instances of acute rheumatism. In both cases alike a soft and not conveyed murmur may be proved, in the event of death, to depend upon valve deposit, and in both alike (I do not say to a like extent), when death does not so intervene, the murmur has been found to disappear. In frank recognition of these facts, Dr. Wilks expresses the belief that all mitral systolic murmurs associated with chorea are organic; and Dr. Sansom,[1] in a short summary of the prevailing opinions upon the subject, admirable for its conciseness, arrives at a like conclusion.

But when this much has been granted and endocarditis is admitted, how much are we the better? What is the mode of origin and what is the sequel of such endocarditis? It is but exchanging one difficulty for another. For we have to suppose, upon this hypothesis, not only that endocarditis may arise in and out of chorea, and that the younger the child the greater the probability of this event, but also that cardiac irregularity sometimes precedes and sometimes takes the place of regurgitation, whilst none of the injurious after consequences which attend endocarditis in its other relations are found to ensue here. In face of such grave objections, we are forced to admit that, although physical signs do not contradict it and post-mortem evidence may seem to be directly in its favour, the theory of choreic murmur (not to speak of the other signs) which invokes endocarditis is too difficult. It is inconsistent with all that we know of that inflammation in its various pathological relations; and apart from these we know remarkably little about it.

It is in fact by virtue of this vague knowledge that endocarditis maintains its hold in this connection. A form of heart inflammation special to chorea, and having a history and mode of termination of its own, is a creation of too shadowy a kind to be easily

[1] Sansom, *Diseases of the Heart*, p. 89.

dealt with. But so soon as anything definite and within reach of investigation is alleged in regard to it, when, for instance, it is said (as Trousseau, Bouillaud, Roger, and other French authors say) that the endocarditis of chorea is in fact rheumatic, although the rheumatic element is itself latent, we have a distinct yet still but partially tangible issue. Of the relationship between chorea and rheumatism I need not speak in this place. I have endeavoured to show elsewhere that although real it is rare and exceptional, and both Walshe and Hayden are of the same opinion. However this may be, no one will refuse to admit that the cardiac symptoms of chorea are observable *sometimes* when there is no open rheumatism either past or present. Now if in all such instances we are to say, in the first place, rheumatism is actually present, but after a secret and ineffable manner, and in the second place endocarditis is the consequence of that rheumatism, but it is an endocarditis which is exceptional in commencing after the chorea has begun and disappearing along with it, we account for the facts no doubt, but after a fashion which rather begs the question than provides for it.

We are thus compelled to regard the heart symptoms of chorea, taking them in their entirety and not by arbitrary selection —the early irregularity, the variable mitral murmur, the very frequent acceleration of heart and pulse with frequent fluctuations in the rate of both—as being altogether special and peculiar. They are signs of the heart's sympathy with the voluntary muscles, and are seen most at that early time of life when the antecedence of acute rheumatism is the least probable. The heart suffers, by whatever mechanism or nervous influence, part and parcel with the rest of the muscular system, or rather it is apt to suffer. Such a conclusion, I say, in some sense or other, seems self-evident, and is indeed involved in the statement that the heart symptoms of chorea are met with in no other association.

Obvious and inevitable as it may be, it is far from being easy of application. For if it be granted, in the words of Dr. Walshe,

'that the apex murmur of chorea is plausibly ascribable to disordered action of the muscular apparatus connected with the valve,' why does not the same disordered action extend to the ventricular walls? It may be answered (although Dr. Walshe does not admit as much) that in young children there is both disorder of rhythm and regurgitation; but the answer is insufficient. These two signs do not commonly concur nor do they vary together. And it is not young children alone that we have to consider, but the elder patients as well; and in these latter, while murmur is not infrequent, any marked irregularity of cardiac rhythm is certainly rare. Thus we have to suppose that the fibres of one and the same muscle are acting regularly as regards the ventricular wall, but irregularly as regards the papillary muscles. 'We should be forced to admit,' say Dr. Hayden, 'that whilst the greater portion of the length of certain muscular fibres contracts with perfect order and regularity, the remaining and smaller portion of the same fibres act spasmodically and out of harmony with the former.' 'No physiologist,' he adds, 'bearing in mind the unity of nerve centres and the community of nerve distribution enjoyed by both portions of the same fibres, would admit such a doctrine.'[1]

There are other objections equally formidable. It is not in the nature of chorea to dissever the normal combinations of muscular movement. It stirs the very same muscles that are employed by purpose or emotion, and moves them in a similar way, only less precisely and with less definition. Apart from anatomical considerations, therefore, a choreic spasm of the heart, which should select the papillary muscles and leave the cardiac walls, would be untrue to the pattern of chorea elsewhere. And again, if this choreic conduct of the heart be but an extension of the same disorder which affects the other muscles (an extension, as Dr. Kirkes points out, to which there is no parallel in any other involuntary muscular organ), the most violent and general chorea ought to exhibit this cardiac disturbance the most. But it

[1] *Diseases of Heart and Aorta*, p. 268.

is not so. On the contrary, the violent chorea of puberty has seldom either cardiac murmur or cardiac irregularity, while the chorea of the young child, which is very rarely violent and is sometimes rather a paresis than a disorder of movement, exhibits both these forms of heart affection very often. And even if these difficulties should be overcome or the ground of some of them disputed, it would still, I think, be hard to understand how the great centre of circulation and (in one sense, at all events, within the experience of everybody), of emotion should become the seat of a mismovement at all resembling the choreic contortions of the visible muscles without giving rise to sensations of grave disquiet, sensations, be it remembered, which, so far as young children are concerned, the favourite subjects of such cardiac disorder, are conspicuously absent.

It would thus appear that both the hypothesis which supposes endocarditis to be the cause of choreic murmur and the hypothesis which supposes an extension of the muscular infirmity to the heart to be the cause of it are fallacious. Both theories commit us to too much. And if, in this strait, we have recourse to vaguer expressions having regard to the 'impoverishment' or 'vitiation' of the blood, we neither provide an adequate explanation nor allege a demonstrable cause. But while thus compelled to abandon one position after another, we must beware lest by too precipitate a retreat we quit ground which it is essential to hold. We may even venture so far upon the assured facts of the case as to make some sort of stand and to affirm something. If the views just announced cannot be held in their entirety they must be held with some modification or other. There is no alternative. Part of the perplexity arises, as has been shown, from a consideration of the harmlessness, variability, and limited duration of the choreic murmur. But if these facts are in themselves secure we may rely upon them to force at least this conclusion, that the conduct of the heart in chorea is similar to its conduct in anæmia. Whatever explanation, therefore, applies best to the precise mechanism of the so-called functional

or dynamic murmur cannot be altogether foreign to the circumstances of chorea.

It is now generally admitted that the murmurs once called hæmic, anæmic, and by similar names, implying dependence on some blood change, are much more often than was at first supposed produced by actual regurgitation, due to a temporary defective action on the part of the mitral valve. Such murmurs are to be heard in purpura, in anæmia, in the general muscular relaxation due to nervous strain, in epilepsy, as well as in typhus, and enteric fever, and even in simple pyrexia. This dynamic mitral bruit may, by exception, be harsh and far-sounding, audible in the axilla and even at the lower angle of the scapula, yet nevertheless by its ultimate disappearance give ample proof that whatever may befal the valve during its continuance (and there is some reason to believe that a material change actually occurs) is not abiding or permanently mischievous. So much, I think, is generally admitted. The question for us now is, whether the same explanation of the mechanism of this murmur which applies to its association with the conditions just mentioned applies also to its association with chorea.

No one, so far as I know, has more ably discussed this subject than Dr. Nixon.[1] His exposition of the various ways in which dynamic apex murmur may arise, and of 'the perfect unity and correspondence in action of the fibres of the walls of the ventricles and of those which are connected with the valves, which is needed in order to ensure complete closure,' suggests to him the inquiry whether this nice correspondence of movement might not be so disturbed by altered nutrition or innervation as to render such closure for awhile defective. The tremor of the voluntary muscles, which is apt to follow upon their violent exercise, is adduced as being analogous to this disordered cardiac action. Dr. Nixon concludes that functional mitral murmur results from 'this want of correspondence between the fibres of the ventricle, which obliterate

[1] *Dublin Journal of Medical Science*, vol. lv. p. 572, &c.

the cavity, and those which close the valve ;' an altered function due, as he believes, 'to some defect in the vital power or condition of the heart itself, which leads either to atony of the papillary muscles or derangement in the rhythm of their movement.' In the further observations of the same author as to the means of separating this murmur from the organic, he alludes to its changeable character, alteration or even disappearance with the upright posture, and the absence (in most instances) of accentuated or double second sound. Thus, in all its essential features, the murmur which Dr. Nixon describes corresponds with that of chorea ; and, except in cases of temporary debility, anæmia and certain conditions already particularised, commonest in the female sex, it is seen in no other connection.

Dr. Hayden, assenting in part to these views, would attribute the dynamic murmur not so much to a want of correspondence between muscular fibres as to atony or parietal debility of the walls of the left ventricle.[1] Weakness and relaxation of the papillary muscles, he admits as a possible cause of mitral regurgitation. Spasm, or irregular action of the same muscles, he does not admit as a possible cause of it. This regurgitant murmur, 'caused by atony and partial yielding of the walls of the left ventricle at the acme of systole,' Dr. Hayden has long associated with anæmia, purpura, and excessive use of tobacco. His later observations lead him to include chorea and fatty heart in the same category.

But the latest and least reserved expression of the opinion that dynamic murmur is in fact dependent on muscular paresis is that of Immermann.[2] 'The muscular tissue of the heart,' says he, 'owing to the altered state of the blood, is easily fatigued, and this liability to premature fatigue extends to the papillary muscles connected with the auriculo-ventricular valves. After any undue exertion of the cardiac muscle a temporary paresis of the musculi papillares ensues. In consequence of this the valve flaps intrude

[1] Hayden, *loc. cit.* p. 274. [2] Ziemssen's *Cyclop.*, vol. xvi. p. 399.

into the auricles with every ventricular contraction, that is, a transient functional insufficiency of the tricuspid and mitral valves is established. As the organ regains its normal energy these grow fainter and ultimately disappear.' He goes on to describe the fatty degeneration of the papillary muscles which sometimes ensues upon simple anæmia, and which explains both the occasional permanence of these murmurs and their occurrence in connection with fatty heart.

It will be admitted, I think, that both the time of appearance and precise manner of the choreic murmur, as well as its mode of origin and duration, varying intensity and limitation to the period of youth, are all nicely provided for in the hypotheses just rehearsed. If only it be granted that the heart's disorder is really a sympathy with the muscular disturbance, an inexact and precarious correspondence between the ventricular contraction and that of the papillary muscles would seem to serve for chorea even more than for the conditions to which Dr. Nixon applies it. Still better, and without making any assumption as to the heart's sympathy, might we admit the doctrine of partial paresis of the valve apparatus, and insist that the excessive muscular movement of chorea is the precise condition which, upon the hypothesis, should give rise to murmur such as we hear in token of fatigue on the part of the heart. Adopting either of these views, we might say with Ziemssen that 'change in the valvular sound is *à priori* more likely in chorea than in any other affection.'[1]

But the matter is not so easily settled. Let it be granted that the choreic murmur is due to a functional disorder on the part of the mitral and probably also of the tricuspid valves, by means of which a temporary and variable regurgitation is permitted (and I think so much of admission is inevitable), we have to ask, in the next place, why this regurgitation, whether it be due to faulty adaptation of the several parts of the heart to one another, or to the paresis of fatigue, is not in harmony with the other symptoms?

[1] *Loc. cit.* p. 440.

If the murmur betokens a sympathy on the part of the heart with the disordered action of the other muscles it ought to appear when chorea is the most generalised ; if, on the other hand, it betokens a fatigue paresis it ought to appear when the chorea is most violent and prolonged. But it does neither. The sympathy of the heart (if it be rightly so called) goes not with the manner or the degree of the chorea, but, as has been shown, with the age of the patient. And, moreover, we should be taking a very partial view of the subject were we to limit the heart symptoms to cardiac murmur. This, we have seen, is but one, and not even the chief, symptom of choreic heart disturbance. There is besides the unevenness or inequality which belongs especially to early childhood, and, most constant of all, there is the accelerated pace of the heart. Moreover, we have not merely to account for the presence of these additional signs, we have to fit them into their places, and to show why the heart, seldom failing to share the muscular disorder in one way or another, exhibits this mode of disturbance or that according to the age of the subject. We may accept either account of the mechanism of dynamic murmur, and without much violence apply it to suit the circumstances of chorea: that is a little gain no doubt. But when that is done there remain these other symptoms, which, unlike valvular murmur, can compare with nothing to be found in other analogous conditions, unless indeed the cardiac unevenness and its acceleration remind us of what is sometimes met with in hypochondriacs and hysterical women, the least promising subjects to throw light upon obscure places in pathology.

It would seem then that to understand the conduct of the heart in chorea we must look to chorea itself and the modifications it exhibits at various ages. Here is an affection which both in absolute frequency and in its tendency to implicate the heart, attaches itself to young children most of all, to older children somewhat less, to adults hardly at all. At each of these periods chorea, both in the limbs and at the heart, shows itself after a particular

manner. If, then, the action of the heart in this disorder is throughout in real harmony with that of the voluntary muscles, the clue to the secret we are in search of must be sought in the special characteristics of those periods of life to which chorea especially attaches—characteristics, that is to say, in which they differ from infancy on the one hand and adult life on the other. If the reader is not already wearied by the length of this exordium and the somewhat circuitous path he has had to pursue, I would venture in such space as remains to take a final survey of the subject from this point of view.

I would observe, in the first place, that the chorea of the post-infantile period is the immediate successor of the muscular spasm or convulsion of the infantile period. At an age varying with the 'forwardness' of the child, the one liability takes the place of the other. The very same material cause (as for example, intestinal irritation, or the troubles of dentition) will excite convulsion in infancy, and chorea a little later. Again, the chorea of early childhood will sometimes commence with convulsion, or the two affections may alternate, the same limbs being affected in both cases. Little, of course, can be certainly known as to the actual sensations of the child at this early age, or of the mode in which physical pain gets mentally interpreted; but it depends probably in some measure upon the degree of completeness of such interpretation whether the response shall be by way of convulsion or by way of chorea. However this may be, the general muscular restlessness of the young child which passes for chorea is not only in close union with spasm in the way just mentioned, it often bears a direct resemblance to it in form. There is an universal unsteadiness in which the muscles of the abdomen and of respiration share as well as the diaphragm and larynx. This generalised chorea which thus succeeds to convulsion is, so to speak, the simplest form of the disorder, without variety, so far as the movements of the several parts of the body are concerned, and without any mental admixture. It is an aggravation of the natural unsteadiness of child-

hood, an universal and equable overmovement or mismovement extending to all those regions which it is the nature of chorea as a motor disorder to affect, and it is this merely. There is no incoordination, for the muscles have not yet learnt to act together; there is no distinction between the movement of one part and another, for the several muscular uses are not yet differentiated, and the limbs are stirred indifferently without method or purpose. Such general, featureless agitation of the body is the proper response to a source of irritation which appeals to no one part in particular and has no mental representation.

With maturer age, the bodily movements become varied and definite, and each department of the muscular system sets about its separate business. And as with movement, so with mismovement. The chorea of later life is a definite deformity, which alters and disfigures the natural carriage in this way or that according to its seat. It selects those muscles which are the readiest to respond to emotion, and moves them as they are wont to be moved by the passions and employments of life. Thus the choreic distortion of the face is one thing, of the legs another, of the arms another; and this separateness becomes the more distinct as the individual grows and his individuality, as it is called, becomes more and more marked. The mismovement of chorea betrays the age of its subject, no less than does the natural movement; and, as life goes on, chorea becomes more and more distinctly localised. In its latest form it is a partial disobedience or misconduct of certain muscles, rendered inveterate by habit, and incorporated, as it were, with the rest of the bodily movements.

My conjecture is that the conduct of the heart in chorea is in strict accordance with these successive modes or differentiations of the muscular disorder. The heart sympathises with chorea, in one way or another, throughout life, or at any rate until that late period is reached when the affection is both rare and difficult to identify. Not to speak, for a moment, of the valvular murmur,

the choreic heart is unrhythmical or irregular in early childhood,[1] accelerated in youth, and left undisturbed in old age. Thus, the earliest period of heart sympathy, that of cardiac irregularity, with or without acceleration, corresponds with that chorea which is a purely motor disorder, the earliest transition from infantile convulsion, and differing from it mainly in the character of the movement, and the implication of the emotional centres ; but resembling it in its exciting cause, wide range, and conformity everywhere to a single pattern. In the heart, as well as the limbs, in the tongue, the speech, the diaphragm, in all the parts, in fact, accessible to emotion, yet without any mental representation of emotion, the choreic disturbance of little children is a purely motor disorder, excited very often, like the earlier convulsion, by a material irritation.

In like manner, the cardiac acceleration of youthful chorea, with or without murmur, corresponds with that form and period of the affection when the several muscular movements have been differentiated, and there is no longer a single and uniform response, but each department of the body liable to chorea responds after its own manner to a disorder which is now first mentally apprehended and intimately connected with emotional exaltation. As to the limbs, there is no longer a mere restlessness impartially distributed, but complicated disorder of movement, in which paresis and inco-ordination are variously blended, and which selects, by well-marked preference, those muscles which are the readiest exponents of emotion. And as to the heart, in place of disturbed action and rhythm, there is the proper emotional response with which everyone is familiar in his own person—an acceleration, namely, and often knocking impulse as well.

Now, at both the periods we are now considering, in child-

[1] Ziemssen's suggestion as to 'the influence of restless muscular action upon aortic pressure and the working of the heart' (*loc. cit.* p. 437), fails to apply, I am convinced by repeated observation, in explanation either of the heart's irregularity or of its rate. It is, indeed, at once negatived by the admission that the heart disturbance of chorea is in no direct proportion to the violence of the muscular disorder.

hood and in youth, both with cardiac irregularity and cardiac acceleration, we have, or we may have, apex murmur. It has been shown already that for such murmur no other explanation applies except the functional one; and indeed, in the case of choreic patients, at that time of life when the so-called anæmic murmur is common, I know not how it is to be determined whether valve defect is due to chorea or to anæmia. The same causes may operate in both cases, and the explanation of Dr. Nixon of faulty adjustment of valve and ventricle may serve for both. But there are still the children to be considered; and, if we are still to apply the argument that the heart symptoms of chorea are in constant harmony with the rest of it, it is necessary to remember that there is another element in chorea besides those that have been alluded to. I mean *paresis*.

The real character of this choreic paresis has been somewhat obscured, I venture to think, by the prominence that has been given to those examples of it which have chanced to affect one side of the body only. I would only remind the reader, in this place, of what has been said before in reference to that strictly localised paresis which mixes with choreic restlessness in children. Sudden both in its access and departure, it may be recognised especially in a droop of the wrist, or a falling of one shoulder, or feebleness of grasp of one hand. It selects this part or that, according to no known rule, and may in some instances show so prominently as to give the patient the appearance of paralysis rather than of chorea. Now, all that can be said of choreic paresis, as we see it in the limbs, may be said as well of choreic murmur, as we hear it at the heart. Both are characteristic of childish, or, at least, youthful chorea; both are sudden in their development, variable in degree, and apt to come and go without any other corresponding change in the character of the disorder.

If, then, weakness and relaxation of the papillary muscles be admitted as a possible cause of mitral regurgitation, and if a

debility of this kind may arise temporarily, from tobacco-smoking or nervous exhaustion, much more should it arise in chorea, where—apart from muscular fatigue—there is a special liability to paresis extending, as it would seem, to all the muscles which the disease is able to effect; and observe that this relaxation on the part of the papillary muscles, which is common both to anæmia and chorea, and productive of regurgitation in both, is not of the same origin in the two cases, nor always accompanied by precisely the same signs. In anæmia it gives rise to an equable murmur, which only ceases with the gradual recovery of the patient; but in chorea it is (or it often is) a variable and inconstant murmur, which hardly repeats itself precisely for two consecutive beats, and which appears and disappears without apparent cause, as does the similar paresis of the voluntary muscles, with which indeed, as I have repeatedly noticed, it may be strictly synchronous, both in its time of arrival and duration. Moreover, with a murmur having this origin, we are rid of the difficulty which attaches to the doctrine of a fatigue paresis, and would require that the valvular defect should be in direct relation to the duration and severity of the chorea; which would associate it, therefore, not so much with childhood, as with that violent form of chorea which is commonest at a later period of life.

Yet still the old objection will recur. Whence comes it that a temporary paresis of the valve apparatus is found to be associated after death, if not with endocarditis, at all events with a deposit of recent lymph on the edges of the mitral valve? That this appearance does not represent a true inflammation of the endocardium is rendered probable by its bead-like arrangement, and limitation to the margin, rather than the auricular surface of the valve. There is never ulceration; and, where time has been allowed to elapse between the chorea and death, the valve is found to be in a normal condition. Only in cases where death supervenes either in the course of the chorea or very shortly afterwards is this appearance met with, and in these not always. There

is ample clinical and post-mortem evidence that it is neither lasting nor injurious.[1] Mindful of this strict limitation of the facts to be interpreted, and of the necessity, in the last resort, of reaching a solution upon the principle of exclusion, the question suggests itself whether an imperfect closure of the mitral orifice, or rather such uncertain action of the valve segments as closes it at one time, but not at another, might not, at the approach of death, and when, with the flagging action of the heart, fibrine is very readily deposited—so determine the seat and method of such deposit as to produce, at the edge of the valve, the bead-like appearance that we see; the condition which immediately precedes death being one of the essential factors of the occurrence.

It may be said, indeed, that whatever is true of the dynamic murmur of chorea must apply equally to the same murmur in anæmia and elsewhere. But of the post-mortem appearances of simple anæmia we know absolutely nothing. There is, however, a disease having a striking likeness to chorea in respect of its preference for the female sex, near connection with hysteria and with mental emotion, and apparently anomalous blending of functional with organic disturbance. In exophthalmic goitre we have at first acceleration of the heart and afterwards mitral murmur, a murmur which sometimes wholly disappears with the complete recovery of the patient, and sometimes is the precursor of organic mitral disease.

In conclusion, I would briefly recapitulate the facts which it has been the object of this paper to establish, together with the hypothesis which they seem to support. The facts are that in chorea the heart is apt to sympathise with the voluntary muscles

[1] See Chap. IV. p. 78. The suggestion in the text is in fact that of Dr. Dickinson. 'The beads,' he writes, 'are usually confined to the inner surface of the mitral valve and arranged along the attachment of the thin edge, where a line of minute but abrupt prominences is presented to retrograde blood, but an arrangement of more gradual slopes to blood flowing normally. Thus possibly the collection of fibrine is the consequence not the cause of the regurgitation.'—*Pathology of Chorea, loc. cit.* p. 37.

at all ages up to the adult period, this sympathy being shown as well by dynamic murmur as by accelerated action, unevenness of rhythm, and, not seldom, the excited impulse common in hysteria, the particular manner of response being dependent upon the age of the patient. The hypothesis is that these several modes of heart affection correspond with as many modifications of chorea, which are exhibited not in the heart only but in the voluntary muscles as well ; these several regions sharing jointly, each in its own degree and after its own manner, in a disorder the area of whose influence is co-extensive with that of ordinary emotional disturbance ; and, particularly, that in all such variations the motor element of the affection is represented mainly by inequality and unevenness of cardiac rhythm, the emotion element by acceleration, and the paresis element by dynamic murmur.

CHAPTER IV.

CHOREA AS A FATAL DISEASE.

Recorded examples of fatal chorea—Age and sex in relation to fatality—Exciting causes—Morbid anatomy—Conclusions.

THE pathology of chorea needs to be discussed upon a wider basis than that which is offered by morbid anatomy ; nevertheless, no survey of the disorder can be considered complete which fails to take into account the evidence to be derived from fatal cases. The review of a sufficient number of examples of this sort, apart from any direct discovery of morbid change, cannot fail to be of service in exhibiting the age, sex, and temperament most liable to succumb to such attacks. We shall be thus assisted in separating from one another a highly dangerous form of convulsion, and that far commoner motor disorder which, whether violent or not, has little or nothing of danger about it, and probably recovers best without active medical interference.

Yet with this obvious service to be got from the study of fatal chorea, its occurrence is so exceptional, that no single observer from his own experience can do more than contribute a very small share of the material necessary for the purpose of drawing any general conclusions. Thus, Dr. Hughes, in so large an hospital as Guy's, was able to collect from all the records by various hands, which had been preserved during more than thirty years, only eleven fatal cases. Dr. Dickinson, from a similar record at St. George's, extending over thirty-three years, collected sixteen such cases, while the large field of observation offered by the Hospital for Sick Children during fifteen years furnishes but

six. These examples, it must be understood, include those dying *with* chorea as well as those dying of it. Although it is not always easy to distinguish between these two classes, it is certain, as will presently appear, that the cases of death attributable directly to chorea fall very far short of the numbers just given. It must be added that many of the earlier records are very defective, that there is no uniform plan of tabulation, and that with different observers different points of interest have received mention. On the whole, it may be said that if all the recorded accounts of fatal chorea in this country which are fairly complete and readily accessible were put together, the total number would not be large, and that in a considerable proportion of these the immediate cause of death and the choreic disorder would be found in very remote and uncertain connection.

Such being the facts of the case, I have thought it of interest to bring together 80 cases of death in connection with chorea, or at least with convulsions resembling and called chorea. They are made up as follows:—(*a*) 3 cases (quoted by Dr. Bright), Med.-Chir. Trans., vol. xxii.; (*b*) 11 cases (Dr. Hughes), Guy's Hospital Reports, 1846 (first series); (*c*) 7 cases (from same source), 1855 (second series); (*d*) 34 cases (Dr. Tuckwell), Bartholomew's Hospital Reports, vol. v.; (*e*) 22 cases (Dr. Dickinson) Med.-Chir. Trans., vol. lix.; (*f*) 3 cases (Dr. Peacock), St. Thomas's Hospital Reports, vol. viii.

With these references and the frequent mention I shall have to make of each of these eminent authors no one can quote against me on their behalf the line that Virgil wrote on the palace gate. The present object is to bring together under one point of view a body of evidence derived from many sources without admixture of extraneous matter. Of the conclusions to be drawn from such evidence the reader will judge for himself.

The points I propose to examine concern the age and sex and common exciting cause of fatal chorea, together with its most obvious morbid associations. It will be seen immediately that

only a proportion of the 80 cases are given in such detail as to be dealt with in all these respects. Thus, Dr. Tuckwell's account is no more than a short summary occupying one paragraph of his paper just quoted. Dr. Hughes's first series is described by himself as 'very meagre and imperfect;' Dr. Bright's 3 cases, although so often quoted, are not altogether in point; in one there was trismus and tetanic spasm, and in a second paroxysmal attacks described as hysteric. In the several enumerations now to be made, therefore, while 80 will be the extreme number dealt with, smaller numbers will have to serve in regard to particular points where the information is defective. With such deduction the cases available in all respects will not exceed 30, but 30 in the circumstances of this disorder is a large number, it is the gleaning of a very wide field, the sum of fatality out of many thousand examples of chorea extending over a long period of years.

Taking in the first instance the gross number 80 as representing so many individuals dying in connection with chorea, the most striking point of all to those who are in the habit of regarding chorea as a child's affection is the large proportion of adults and the small proportion of children. Of the 80, 48 are over thirteen years of age, and the ages of two are not stated. Excluding Dr. Tuckwell's numbers, where further particulars are not given, we have in 46 fatal cases 27 who are over thirteen and nineteen who are under that age. Of the 27 over thirteen, as many as 23 may be said to have died *of* chorea. Of the 19 children, 10 at the utmost died *of* it, the youngest of these being a girl of seven (No. 19 in Dr. Dickinson's table, *loc. cit.*). Or, again, excluding Dr. Hughes's first (and defective) series, we should have, out of a total of 35, 20 fatal cases over the age of thirteen, of whom 16 died apparently *of* chorea; and 15 under thirteen, of whom only seven died apparently *of* chorea. We thus establish the fact, making large allowance for error (which from the nature of the material cannot be wholly excluded,) that the mortality of children directly from chorea is exceedingly small,

and that seven is the youngest age at which it is known as a fatal disease in a very extensive review. We find also, as we should expect in view of the comparative commonness of chorea in children, that the proportion dying *with* chorea but not *of* it is greater with them than with adults.

But next in regard to sex. In 46 fatal cases (again excluding Dr. Tuckwell's) 34 are females and 12 males. Of the 34 females 8 only were children, the youngest (mentioned above) seven years old, and one described only as 'a child.' As many as 26 were young women, 11 of whom, there is good evidence to show, died *of* chorea. Of the 12 males 9 were adults and only 3 young boys. These latter are made up as follows: 1 is in Dr. Hughes's first series (No. 6), 1 is in Dr. Dickinson's table (No. 14), and died of heart affection 'without return of chorea,' and 1 is a case of the late Dr. Fuller's (No. 9, Case 15, Append. A.) that died under my own observation as then Medical Registrar at St. George's Hospital, after five months of almost persistent convulsion. These three boys were each eleven years old. It does not appear upon the evidence before us that chorea is ever fatal to males at an earlier age than this, nor have we more than one out of the three whose death is immediately attributable to this disorder.

The puberty age, then, is the age of fatal chorea. If we take forty-six as representing the total number of persons dying in this connection, thirty-five would be at or a little above the age of puberty, and twenty-five of these young women.[1] We are thus led to associate fatal chorea with the disturbing incidents of a critical period of life. And the more so inasmuch as in those instances where exciting causes are actually discovered and recorded (but a small proportion, it must be remembered, of the whole number), there is frequent mention of some special excitement of those parts and organs which in the plan of nature are properly over-active at this particular time. Thus Dr. Hughes, in his

[1] There is but one elderly person on the list, a woman aged fifty four, who had had chorea for four years.—Dr. Dickinson, *loc. cit.*, No. 15.

second series of cases, finds the genital organs unusually excited in three of the four cases examined, while in Dr. Dickinson's table out of nine dying directly of chorea, and with causes assigned, there are three in whom these causes are distinctly sexual.

And not only does fatal chorea attach peculiarly to the emotional sex and the emotional time of life, there are but few instances of it out of the few fully detailed cases which constitute our entire material in this matter where mental excitement does not concur with the bodily over-movement. Such mental disturbance embraces all varieties, from the hysterical to the maniacal. Here again, therefore, a distinction appears between the fatal chorea of adolescence and the non-fatal chorea of childhood. The latter, even in its greatest violence, is commonly quite apart from emotion. The disorder acquires this mental admixture at the same time that it reaches what may be called its dangerous age. It will be perhaps better in this place to cite instances rather than to quote figures. The condition to which I am alluding is manifested by particular incidents. Thus in a case related by Dr. Hughes (first series, loc. cit. p. 390), a man of twenty-five, with violent and ultimately fatal chorea, was 'sensibly hurt and shed tears when the bystanders observed that he could restrain the movements if he pleased.' In a second case, by the same author (second series, p. 250), that of a girl of eighteen, the symptoms 'which were at first slight were suddenly aggravated by fright caused by a patient in the same ward, and she became almost maniacal.' In a third instance (from the same series, p. 251), a girl of sixteen, where 'there was unusual excitement of the generative organs,' the symptoms at first 'partook of the character of hysterias, the patient appeared strange in her movements, and fancied that others were laughing at her.' In a fourth, a boy of sixteen, 'supposed to be addicted to secret vice, his early movements excited the derision of his comrades. Their conduct depressed him much, and he went suddenly into a fit, after which violent and universal chorea supervened.' In all three of Dr.

Peacock's fatal cases mental excitement is a prominent feature. In one of the very few cases that are recorded of chorea fatal as early as ten (Dr. Dickinson, loc. cit. p. 2), it is related of the child (and some will probably regard the relation as trivial), that a little friend of hers had lately died of chorea, she had watched and imitated the movements, and when she recognised them in her own person made sure that she should meet the same fate. If it be remembered from how small a number of examples these instances are taken, even these few quotations will be allowed to have weight in showing the common habit of fatal chorea. I think it may be said, indeed, not only of fatal chorea but of chorea that at any part of its course threatens to be fatal (a comparatively large number), that amongst the symptoms that give alarm nervous exaltation (so to speak) is generally one.

But while the emotional origin of chorea is thus apparent, as well as the direct influence of mental causes in determining its fatal issue, it is not to be doubted that fatal chorea arises in some instances in immediate connection with acute rheumatism. The evidence upon this point now before us is to the following effect: —Out of thirty-two fatal cases dying *with* chorea, and reported with sufficient fulness to be available (viz., seven of Dr. Hughes', second series, twenty-two of Dr. Dickinson's, and three reported by Dr. Peacock), seven had a rheumatic origin. Selecting out of the thirty-two eighteen who died directly *of* chorea (viz., five of Dr. Hughes', ten of Dr. Dickinson's, and all three of Dr. Peacock's), we get three—a male and two females, *all adults*—where the fatal disorder was of rheumatic origin. These numbers corroborate the conclusion arrived at upon independent grounds (Chap. II. p. 41)—viz., that acute rheumatism, although having but a small share in chorea, is nevertheless veritably associated with it, and especially with its fatal form at the puberty age.

Coming now to the morbid associations of chorea in so far as they are revealed post mortem, the evidence before us fully bears out the belief expressed by the late Dr. Kirkes in 1863, 'that

further experience would still more positively demonstrate that an affection of the left valves of the heart with the presence of granular vegetations upon them is an almost invariable attendant upon chorea, under whatever circumstances the chorea may be developed.' The singular accuracy of this description, the need of 'almost,' and the justice of applying the observation to chorea of whatever origin, and not limiting it (as some would do even now), to rheumatic chorea, or even to chorea fatal as such, will be seen in what is now to be said. Out of all the cases in which the condition in question is especially mentioned I can find but five where the heart valves and pericardium are reported healthy, one of these being an elderly woman. Wherever the heart is affected the mitral valve is affected ; the aortic valves are implicated often, the pericardium sometimes. This heart affection occurs equally in those that die in connection with chorea, and in those that die directly of it. Thus, of Dr. Dickinson's twenty-two there are, as I reckon, twelve dying *with*, but not *of*, chorea ; of these ten have mitral valve vegetations, and two have not. Of the ten dying *of* chorea seven have vegetations, and three have not. In Dr. Peacock's three cases, all dying *of* chorea, two have vegetations, and one has not. The valve deposit, which for shortness I thus name, may be either old or new, and variously connected with the mitral valves on their auricular side. The condition would seem to be an accident of the disease it accompanies, having but little apparent connection with its fatal result. It so happens that of the five cases just mentioned as being the only examples of chorea occurring with perfectly healthy heart, all save one, the old woman, are typical instances of deaths in and by chorea. Three were girls at about the puberty age (Nos. 1, 5, and 8 in Dr. Dickinson's table), and one is a girl of Dr. Peacock's, aged twelve (St. Thomas's Reports, vol. viii. p. 29).

With the exception of this observation in regard to the heart and pericardium, there is little to be gathered in the material now before us as to the morbid anatomy of fatal chorea. I need not

again refer to Dr. Dickinson's investigations as to the minute nervous changes in seven of the cases here mentioned, nor to those of Dr. Tuckwell upon embolic plugging, in the paper above quoted. Speaking generally, it must be said that the state of the brain and cord is not described in sufficient detail to be instructive. In a large proportion the brain, in a few the cord, is described as 'congested.' In the case of the boy to whom I have alluded as the single example of the kind in my own experience or in these tables, it was observed that 'the grey matter of the cord was altered and yellow in patches,' but there was no minute examination.

How far the foregoing particulars may serve to fortify or disturb pathological doctrines I do not now inquire. Their practical teaching is obvious. We are justified upon this evidence in looking upon severe chorea at the puberty age, especially in connection with sexual excitement or with acute rheumatism, as a dangerous disorder apt to terminate fatally. It is true that we do not number many fatal cases, but it is also true that we do not meet with many, whether fatal or otherwise. The condition of such patients is the more precarious when, as is commonly the case, there is emotional as well as motor disorder. Such nervous exaltation, which is commonly altogether absent in the more familiar chorea of childhood, is with these both the sign and the source of danger. They are in a state of extreme sensitiveness, and lay hold of trivial circumstances to aggravate their disquiet. The smallest incident, the conduct of bystanders, undeserved reproach or ridicule, or even the sight of a patient affected like themselves, will often have its immediate prejudicial influence in a degree which those who have little experience of this kind of convulsion (whose actual title to the name of chorea, as Dr. Bright's cases show, is often far from obvious), will find it difficult to believe. The question cannot but suggest itself, whether in these circumstances we address our treatment sufficiently to this mental state.

But the facts before us have this further teaching. If we

exclude puberty, chorea of whatever violence is hardly dangerous to life. If we exclude both puberty and the female sex, chorea of whatever violence is not dangerous at all. Now violent chorea is by no means uncommon with boys. Thousands of examples of it must be comprehended within the period we are now reviewing. And yet in all that time, and from so many fields of observation, we get but one boy, aged eleven, dying of chronic chorea after five months, and probably with sclerosis of the cord. Chorea therefore, we may say, extremely rarely fatal in young girls, is practically speaking, never fatal in young boys. If we add to this, what will not be denied, that permanent disablement from chorea is very uncommon, and that there is no treatment that even pretends to avert such after-effects, we get a strong argument in favour of leaving childish chorea alone. It will be further strengthened by a perusal of the valuable papers, published in 'The Lancet' of November 18, 1876, by Drs. Tuckwell and Gray, upon 'The Expectant Treatment of Chorea.'

The conclusions [1] to be derived from the foregoing review may be expressed as follows :—

1. Chorea, regarded as a disease of itself fatal, belongs almost exclusively to puberty, and especially to female puberty ; its immediate exciting cause having distinct reference, in many instances, to conditions of unusual sexual excitement.

2. Besides the operation of sexual causes mental disturbance has to be reckoned ; not fright only, but worry, anxiety, and despondency also, while the force and influence of such impressions is to be seen in the course as well as in the origin of fatal chorea.

3. Acute rheumatism appears as a cause of fatal chorea in but a small proportion of cases ; yet the association, infrequent as it is, is distinct and unquestionable.

4. Chorea in its fatal, no less than in its non-fatal forms, shows

[1] I had intended to supply an Appendix to this Chapter, setting forth in detail the figures upon which the main conclusions are based, but have refrained from doing so because the material in that shape would occupy much space. The deductions here insisted on stand out so clearly that the more general statement of the text will probably be thought sufficient.

strong preference for the female sex at all ages. Children, however, very rarely die of it, and boys, practically speaking, never.

5. Mental excitement, in varying degree (although not amongst the symptoms of ordinary chorea), is met with in so large a proportion of its fatal examples that we are justified in regarding this concurrence as of bad augury.

6. 'Vegetations,' new or old, on the auricular surface of the mitral valves, with or without similar deposit on the aortic valves, and sometimes with pericarditis, are met with in the great majority of cases dying of, or with, or shortly after, chorea. This condition, however, does not, as a rule, contribute directly to the fatal issue; it is found equally amongst those that die *with* and those that die *of* chorea; and in some of the most marked and typical cases of fatal chorea the valves of the heart have been found absolutely healthy.

7. There is no other post mortem condition, except that which concerns the heart, occurring with sufficient frequency or uniformity to be regarded as characteristic of fatal chorea.

CHAPTER V.

THE PATHOLOGIES OF CHOREA.

Connection with rheumatism—with spinal meningitis—with pericarditis — with enfeebled nutrition—The embolic theory of chorea—Vascular and nervous changes—Disturbed nutrition of cerebral ganglia—Altered states of blood—Chorea a functional disturbance—Continental opinion—Summary.

I PROPOSE to set down in this place, in something like chronological order, a short summary of the several hypotheses as to the pathology of chorea which have been put forward since the time that the disease was first accurately described.

The connection of rheumatism with chorea was first asserted at the beginning of this century. Dr. Bright mentions that in the 'Syllabus of the Practice of Medicine,' published at Guy's Hospital in 1802, 'rheumatism is distinctly mentioned as one of the existing causes of chorea.' He adds that in later editions of the same work, as in that of 1820, chorea is said to alternate with acute rheumatism, 'but through what organ or by what intervention it occurs is not conjectured.' In the following year, and independently, as he expressly asserts, of these earlier observations, Dr. Copland drew attention to the rheumatic origin of chorea, upon the evidence of a case which he quoted of rheumatic pericarditis and disease of the membranes of the spine, with which chorea alternated. This change from rheumatism to chorea he sought to explain by 'metastasis from the joints to the membranes of the spinal cord.' 'In nearly all the cases,' he writes, 'there has been a marked disposition of the rheumatic inflammation to

recede from the joints and attack the internal fibro-serous membranes, as those of the cerebro-spinal axis and the pericardium.'[1]

A more precise reference to the pericardium in association with chorea occurs in the paper by Dr. Bright, from which I have just quoted, on 'Cases of Spasmodic Disease accompanying Affections of the Pericardium' (Med.-Chir. Trans., vol. xxii.). In this communication the author dissents from the conclusions of Dr. Copland, connecting chorea with spinal meningitis, and expresses his belief that a much more frequent cause of chorea is pericarditis, 'although in some instances the coverings of the cerebro-spinal mass might be implicated.' From the inflamed pericardium, as Dr. Bright supposed, 'an irritation was communicated to the spinal cord,' of which irritation convulsive movement was the consequence.

It is to be remarked, however, that Dr. Bright's cases, as described by himself, are illustrations of spasmodic disease rather than of chorea. In one of them there were epileptic seizures and tetanic spasm; in another the spasms put on the 'character of most violent convulsions,' 'more violent,' it is added, 'than is almost ever seen in chorea.' Both these cases were fatal. In some of the other examples 'there might be doubt,' as Dr. Bright admits, 'of the correctness of the diagnosis.' What this paper seeks to make out is indicated by its title—the connection, namely, between violent and often fatal muscular spasm and pericarditis, the patients not being children, but young men and women.

In order to show how little such views found acceptance in this country, and how vague and indefinite was the pathology of chorea more than ten years later, Dr. Todd's opinion may be next quoted. 'It is easier,' says this physician (in lectures published in 1854, but delivered some time before), 'to say what chorea is not, than to describe what its essential nature is. We may regard it as a disease which depends upon a debilitated state of the system, which does not in any way arise from an inflammatory or hyperæmic state of any part of the great nervous centres or of other

[1] See Copland's *Dictionary*, art. 'Chorea.'

organs. Almost without exception, in those cases which terminate fatally, we fail to detect any morbid alteration which physiologically could give rise to the phenomena.' 'If I were to refer to any particular part, it would be to that which may be regarded as the centre of emotion. The remarkable frequency with which the attack has been traceable to fright as its cause points clearly to this part of the brain as the *primum movens* in the production of choreic convulsions. The chain of phenomena would then be as follows: first, a peculiar diathesis; secondly, a more or less enfeebled nutrition; thirdly, a strong mental impression which disturbs the centre of emotion, and through it deranges the action, more or less, of the nervous system and of a corresponding portion of the muscular system.'[1]

It was eleven years after Dr. Bright's paper, namely, in 1852, when the reality of the connection between rheumatism and chorea had been recognised by text books as well as the occurrence, in the latter affection, of systolic murmur, that Dr. Kirkes wrote his celebrated essay, destined to exercise an important influence upon pathology, 'On some of the principal effects resulting from the detachment of fibrinous deposits from the interior of the heart and their mixture with the circulating blood.'[2] Towards the end of this paper, in the form of an incidental remark, occurs the passage which may fairly be regarded as the origin of what is now called the embolic theory of chorea. 'I would suggest,' writes Dr. Kirkes, 'that many functional disorders of the nervous system, especially chorea, may be thus explained [*i.e.* by cerebral embolus]. The frequent existence of a cardiac murmur in chorea, and the presence of warty vegetations on the valves of the heart so commonly found in fatal cases of the disease, are in favour of such a view.' Of the numerous modes of application of this remark it is impossible to speak in detail. With the knowledge of a frequent concurrence of chorea and valvular murmur, coupled

[1] Todd's *Clinical Lectures*, 'Nervous System,' p. 442.
[2] *Med.-Chir. Trans.*, vol. xxxv.

with the very general belief in some connection between chorea and rheumatism, it was certain, even if Dr. Kirkes had failed to make this special reference, that the phenomena of embolism would be made use of, sooner or later, on behalf of a disorder sorely in want of explanation.

Of the development of this doctrine, and the mode in which it is now expressed, Dr. Hughlings Jackson may be taken as the exponent. 'I suppose,' says this pathologist, 'that the excessive movements occurring either in chorea, or in epilepsy, or epileptiform seizures, are produced by discharges of grey matter, which, except for great instability from over-nutrition (not better nutrition), is healthy. We cannot expect to discover, with our present means of research, the alterations in grey matter on which excessive discharges depend.' 'My opinion is,' he goes on, 'that the direct pathological state leading to instability of grey matter, producing choreal movements, is increased quantity of blood in the periphery of the capillary district embolised.' 'Of course,' he adds, 'this opinion is hypothetical, and so is every one's opinion as to the nature of lesions insusceptible of anatomical demonstration.'[1] As regards the seat of these lesions, Dr. Hughlings Jackson, following Russell Reynolds, fixes upon the corpus striatum, insisting that there is frequently disease of that part of the brain which superintends the movements of the tongue in uttering syllables. He asserts, moreover, 'the frequent one-sided nature of the movements of the limbs, and *their often dying out into definite hemiplegia*' (words which I venture to italicise), 'as pointing to disease at or near the corpus striatum.'[2]

It has not escaped Dr. Hughlings Jackson that the special character of choreic movement as contrasted with the convulsion of epilepsy needs some apology. 'The elaborateness of the movements,' he says, 'is strong warrant for the inference that the changes causing them must be seated in the brain and not in the

[1] *British Medical Journal*, Dec. 23, 1876.
[2] London Hospital *Reports*, 1864

cord ; and he thinks it ' most probable that the convolutions are the parts diseased.'

From views thus mainly hypothetical we may turn to those of Dr. Dickinson, arrived at directly from post-mortem evidence, and which, in the opinion of their opponents, only fail when the attempt is made to apply them to the actual symptoms of the disease in question.[1] It is impossible in this summary to reproduce an adequate account of the facts upon which Dr. Dickinson depends for his conclusions. These facts are based mainly upon a minute examination of seven fatal cases of chorea, or, as I should prefer to describe them, fatal cases *with* chorea, in three of them at least the choreic movements being of no great severity.[2] The morbid changes, described as remarkably constant in kind and place, are thus summed up by the author. ' In *place* the changes affected both brain and cord. As regards the two sides of the body they were either exactly symmetrical or tended to be so. The parts of the brain most amenable lay between the base and the floor of the lateral ventricles in the track of the middle cerebral arteries ; the substantia perforata, corpora striata, and the beginning of the Sylvian fissures. In *kind* the changes were all connected with vascular disturbance. The injection was general to all the vessels, most marked in the arteries ; when the sources of hæmorrhage could be determined they were always arterial ; the degenerations were usually periarterial, and the spots of sclerosis similarly placed. The first visible change would seem to be the injection or distension of the arteries, succeeded by

[1] *Med.-Chir. Trans.*, vol. lix. p. 15, 'On the Pathology of Chorea.'

[2] Thus in Case 1, a girl of ten, the child is described as restless and sleepless, her movements much increased on the 21st, on which evening, ' after acute pains in the lumbar region, she somewhat unexpectedly died ; ' there were vegetations on the aortic as well as the mitral valves. In Case 5, a boy of eleven, the use of the limbs and the power of speech were slowly restored, and the boy was sent into the country convalescent. There ' his heart symptoms became more pronounced, without any return of those of chorea.' He died of his heart disease. In Case 6, a girl of thirteen, ' the symptoms were not apparently threatening, and the chorea in particular obtained little attention.' She too died suddenly and had both mitral and aortic disease.—*Vide loc. cit.*, pp. 1 *et seq.* A similar remark will apply to some of the fatal cases of chorea by other authors. See e. g. H. Jones, *loc. cit.* p. 560.

extrusion of their contents to the irritation and injury of the surrounding tissue.

'Of the cord no region was exempt; but perhaps the cervical and dorsal regions were usually more affected than the lumbar.' Both white and grey 'shared in the vascular distension. This condition, however, was usually most marked in the vessels belonging to, or in connection with the lateral part of the grey matter about the root of each posterior horn. This was also the chosen situation of the more definite and special changes.' In commenting upon these changes as a whole, the writer observes: 'The nature and steps of the morbid process are open to view, hyperæmia, exudation, and its consequences, but not so the causes in which the series has taken origin. Arterial repletion seems mainly concerned in the development of the disease.'

As regards embolism, the author remarks not only upon the absence of any signs of such impaction, but upon the constancy with which the changes repeated themselves in certain portions, and the equality with which they affected both sides of the body as conclusive objections to that hypothesis.

'The results,' says Dr. Dickinson in conclusion, 'in muscular excitement rather than in paralysis or loss of sensation, may be associated with the character of the lesions, which are points of irritation rather than planes of section, and as such calculated to produce irritation rather than paralytic effects, not so much to cut off, as unnaturally to excite nervous function.' The author alludes to the similarity between the morbid changes of chorea and those of diabetes, and he concludes with a bold attempt to bend clinical observation into some compliance with the demands of morbid anatomy. 'Every period of life has its own regions of nervous susceptibility; in childhood the motor; in adolescence the emotional; in advancing years the mental, and coevally, or nearly so, that part of the nervous mechanism which instigates glycosuria. Much the same mental impression may make a child choreic, a girl hysterical, or a man diabetic. And thus both in

external origin and in the nature, though probably not in the site of the organic changes, we see resemblances and alliances between nervous disorders which in their symptoms betray little similarity.'[1]

In noticing these observations of Dr. Dickinson the advocates of embolism maintain that the condition just described is not incompatible with that theory. 'The local periarterial softenings,' Dr. H. Jackson suggests, 'account for the choreal paresis,' while the cerebral changes described are not very unlike those producible by embola, regard being had to size of arteries plugged.' He admits at the same time that the embolic hypothesis supposes the cord to be unconcerned in the irregular movements of the disease, and that, as a matter of fact, the absence of embolism is much more common than its presence.

Dr. Bastian,[2] supporting in some respects the conclusion of Dr. Dickinson, and relying with him upon anatomical evidence, agrees with Dr. Hughlings Jackson in attributing chorea to a disturbed nutrition in the corpora striata and adjacent parts. In place of embolism, however, he would put thrombosis. He points out that the production of multiple minute thromboses 'might easily give rise to minute vascular injections,' but is careful to add that 'other hyperæmias, more or less secondary in their duration and mode of origin, may easily be confounded post mortem with those which are hypothetically supposed to lie at the root of chorea.' support of this opinion he refers to three cases of his own, where, with hyperæmia of the ganglia at the base of the brain, and especially the corpora striata, occlusions were found in the small vessels of these parts.[3] He sums up his view of the etiology and pathology of chorea: 'I look (certain rare cases excepted), to an altered and often anæmic blood state as its predisposing cause in individuals of a certain age and nervous temperament. Secondly, I look to the initiation in such individuals of a disturbed nutrition

[1] *Loc. cit.* p. 39. [2] *British Medical Journal*, Jan. 20, 1877.
[3] Ibid. July 13, 1877, p. 38.

in the corpora striata and adjacent parts of the brain, tending to issue and often actually issuing in what may be called a subacute inflammation of these centres, often characterised in part by the production of multiple minute thromboses.'[1]

In harmony with these views, so far as regards locating chorea in the corpus striatum and optic thalamus, and in partial agreement with them as accepting capillary embolism of these parts and of their vicinity as one of its causes, we may notice next the opinions of Dr. Broadbent which have especial weight owing to their wide acceptance both in England and Germany. In addition to embolism of the regions just named, Dr. Broadbent[2] would recognise many other sorts of disturbance of nutrition of the cerebral ganglia, 'as, for instance, peripheral influences arresting the reflex process, direct lesions of the ganglia due to fright or to mechanical lesions,' as possible causes of chorea. 'The processes of chorea are in fact such as weaken the force of the nervous apparatus without destroying its structure. Hence the weakness of the muscular force and diminished sensibility so common in chorea. Hence also its frequent termination in paralysis.' To the condition of system of which chorea is the consequence, Dr. Broadbent gives the name of 'delirium of the sensory motor ganglia of the brain.'

Having thus reached, in our search after the anatomical basis or material of chorea, the point at which it is affirmed that the nervous apparatus is *weakened*, but not destroyed, and that the condition of the nervous ganglia concerned is best described by such a word as *delirium*, we may fairly conclude that anatomical hypothesis has pretty well exhausted itself. But when physical changes are lost sight of, there still remains a wide field of conjecture, if not of research. We leave the tissues, and make appeal to the blood.

Variously expressed by various authors, and favoured in part

[1] *British Medical Journal*, Jan. 20, 1877.
[2] Ibid. April 17-24, 1869.

by some of those I have just quoted, the doctrine which connects chorea with an altered condition of the blood finds perhaps the frankest and most unreserved statement at the hands of Dr. John Ogle, with whom Dr. Hammond, of New York, fully agrees.[1] It may be objected that the hypothesis does not so much account for the origin of chorea as for its consequence. Recognising the frequent occurrence of fibrinous deposits on the heart's valves in chorea, Dr. Ogle[2] is led to regard these 'as results of some antecedent condition of the blood, common also to the choreic condition.' In rheumatism and in anæmia, 'conditions both of them associated with chorea,' Dr. Ogle observes, 'an excess of fibrine in the blood, which renders it very prone to be precipitated.' 'May not this hyperinosis,' he asks, 'be the explanation of the coincidence alluded to? Speculation might suggest that the fibrinous deposits arise from some interference with the degree of solubility of the fibrine induced by the presence of some ununited elements within the blood, produced by the excessive muscular action and other functional disturbance which exists in the choreic state, this being not in any way related to this state as a cause, but as a consequence.'

From conjectures like these the transition is easy to a pathology of chorea which makes no attempt at exact anatomical description, but refers, in terms which, although general and inexact are yet sanctioned by physiological use, to altered cerebral nutrition and abnormal conditions of nerve discharge. Among the most striking and satisfactory of such hypotheses is that of Dr. Barnes, who has been led to consider chorea in its connection with pregnancy. 'The condition upon which the latent disposition to chorea depends,' he says, 'is some change of nutrition or of structure of the nervous centres, unimportant under the ordinary conditions of life, but liable to be called out into renewed activity under that special increase of central nervous development which is the constant at-

[1] Hammond on *Diseases of Nervous System*, p. 614.
[2] *British and Foreign Med.-Chir. Rev.*, Jan. 1868.

tendant upon pregnancy.'[1] The chorea of puerperal women Dr. Barnes believes to be almost always a revival of the same disease in childhood, having pregnancy for its immediate exciting cause, in virtue of 'the exalted central nervous irritability' of that condition, which is thus 'a test of the soundness of the nervous system.'

As nearly in accord with these views, I may allude next to the opinions of Dr. Handfield Jones; and here, even more than in the previous instances, comes the difficulty of doing justice to the author in such curtailed statement as the present design necessitates. The following quotation, however, gives in Dr. Jones's own words a summary of his opinion. For its illustrations I must refer to his well-known work.[2]

'The view which I take of the pathological events in chorea is the following. The motor centres especially, and also not unfrequently the intellectual, emotional, and sensory, in persons of weak organisation, fall into a state of paresis, either in consequence of a shock or more gradual injury, or of some toxic matter in the blood, or of peripheral irritation, all of which may generate the same peculiar condition. The paresis in all these parts may take the form of hyper-excitability or of paralysis, the former being much the more frequent. The nerve exhaustion, aggravated more or less by the jactitation, involves the vaso-motor nerves of the cerebral and spinal arteries especially, and conditionates relaxation of their muscular walls as well as impairment of the tone of the capillaries and hæmorrhage. These, however, are of course not necessary events, even in fatal cases. Occasionally actual inflammation of the nerve-centres results from the hyperæmia. Pulmonary congestion and consolidation may be produced in the same way, and possibly, in some instances, valvular lesions of the heart. This view, that chorea is essentially a functional disorder of the motor centres, is in harmony with its frequency in children and females, whose motor apparatus is more prone to be weak and

[1] *British Medical Journal*, Dec. 9, 1876.
[2] *Functional Nervous Disorders*, p. 361 *et seq.*

irritable, with its affinities to epilepsy, hysteria, paralysis, and insanity.'

As for the connection between chorea and rheumatism, it seems to Dr. H. Jones to be best explained by regarding the motor disorder in just the same light as we do delirium, to which it has much affinity. 'In typhoid we have an intestinal lesion, and commonly delirium; but we do not assume a connection between these, but consider the specific poison to give rise to both. In rheumatic fever we have also often a lesion (cardiac) and delirium, both as co-products of the cause of rheumatism, not one as the cause of the other. If we substitute motor disorder for intellectual, why need we change our view?'

In this brief statement it still remains to notice some of the theories and researches of continental pathologists. Yet any detailed account of these may be excused after the admission of Ziemssen, that 'the sum of knowledge of the pathologico-anatomical changes of chorea is so small that it is scarcely of consequence to attempt to explain it.'[1] It is admitted that England and France have been the chief contributors both to the statistics and pathology of the affection, while in Germany the observations of English pathologists upon the embolic origin of chorea and its connection with endocarditis have attracted more attention than any investigations of their own. It is due, however, to the high authority of certain continental observers now to be named that their contributions to this subject should shortly be referred to.

Rokitansky, in 1857, asserted the occurrence in chorea of interstitial connective-tissue growth in the central nervous system; and Steiner, ten years later, confirmed the observation in a single case, and so far as it concerned the spinal cord. He found also, in two cases, serous effusion within the spinal canal, and in one, hæmorrhage at the upper part of the cord at the exit of the nerves. Similar changes, so far as the cord is concerned, together with

[1] Ziemssen, *loc. cit.* p. 460.

hyperæmia of the medulla and spots of softenings, have been now repeatedly met with. Yet it is to the brain, rather than the cord, that continental observers, upon considerations of physiological necessity, have chiefly looked to discover the structural basis of chorea.[1] The cerebral changes, it is asserted, affect the brain cortex and grey substance of the great basic ganglia; but their precise character is far from being exactly stated, and is made to rest rather upon clinical facts than direct observation. As with the cord, the brain changes are said to include interstitial hyperplasia, with regressive metamorphosis of nerve elements, sometimes confined to one hemisphere or its great ganglia, and sometimes diffused over the whole brain, preferring the grey substance, and extending always to the cord, and even the peripheral nervous system.[2]

Again, Charcot has recorded some observations upon cases of hemichorea after hemiplegia, in which cicatrices were found at the posterior end of the optic thalamus, and (in two cases) of the anterior corpus quadrigeminum of the affected side. In other instances, where hemiplegia followed chorea, the same observer found a blood clot as large as a nut in the posterior half of the optic thalamus. In accepting the evidence of such cases, however, we are clearly transgressing the proper limits of our subject, and complicating the pathology of chorea with that of paralysis.

A similar objection applies to many of the other quoted cases, where it will be found that the chorea is combined with some other affection, as with mania or encephalitis. It is admitted, indeed, by Ziemssen and others—and I shall presently quote instances of this kind—that 'chorea may occur as a transitory phenomenon in

[1] Ziemssen, *Cycl.*, *loc. cit.* 457 *et seq.*

[2] As regards the latter, the observations of Elischer may be quoted. He found the changes just described for the cord equally marked in the peripheral nerves, the connective tissue between nerve bundles being greatly developed, and the medullary sheaths of the nerve fibres tumefied, while their axis cylinders had disappeared. The nerves examined (the median and sciatic), seemed to the naked eye abnormally small and flat.

the course of cerebral lesion, and presently give way to other and severer disturbances.'[1] It is misleading to adduce the post-mortem appearances in such cases by way of evidence of the changes attending chorea.

Lastly, experiments have been made upon animals by Chauveau and others,[2] and it has been shown that the muscular twitchings of dogs persist after section of the cervical cord, and, further, that these may be produced or increased by mechanical irritation of the posterior columns. Thence it is concluded that the limb-twitching depends on the cord, and not on the brain. But such information is not in point, for the simple reason that this canine affection is not really chorea, or at all like it.

In reviewing the several observations and conclusions which have now been enumerated, it is easy to see that the theories in reference to chorea which have successively gained acceptance represent so many attempts to accommodate this particular affection with the pathological doctrines of their day. When first emerging from the obscurity of humoral pathology, chorea, in virtue probably of the pain that often attends it, is found in some sort of alliance with rheumatism. Presently, upon the observation of its occasional association with acute rheumatic arthritis, the prevalent belief in metastasis is appealed to, and the muscular disorder is accounted for by an inflammation transferred from the joints to the spinal cord. Next, and following the researches of Marshall Hall upon the functions of the cord, we find the principle of reflex irritation made use of to explain the dependence of chorea upon pericarditis. At a still later period, and when further observations of the heart symptoms of chorea had made the application easy, comes the discovery of embolism, both to explain the cardiac disturbance and to satisfy those phenomena of the disease which better study had shown to depend upon the brain rather than the spinal cord.

[1] See for example Case 4 in Appendix.

[2] *Arch.-Gen. de Méd.*, March, 1866, 455.

But while the pathological history of chorea has been one of revolution, its clinical history (in so far as the two may be separated) has been one of almost continuous progress; and it has come to pass with the gradual accumulation of facts, that, while precise and definite hypotheses have been found faulty and insufficient, the only adequate pathology of chorea hardly goes further than to translate its symptoms into physiological language. We have mere definitions of the disorder which are unassailable, which venture nothing and explain nothing; but what is wanted is some explicit statement of the anatomical conditions on which chorea depends which may be brought into harmony with its actual phenomena.

CHAPTER VI.

THE PATHOLOGIES OF CHOREA IN THEIR APPLICATION.

Clinical conditions to be satisfied—The symptoms of embolism compared with those of chorea—The direct evidence in favour of the embolic theory—Perivascular degeneration of the brain and cord as a cause of chorea—Hypothetical explanations—Chorea ascribed to temporary trophic changes—Application of such theories—The ataxy of chorea.

I TURN then once more to chorea itself, and would place side by side with it the several hypotheses which have just been enumerated. No theory can be finally accepted which fails to satisfy all the conditions of the problem. There are certain features of chorea which are obvious and beyond dispute, as that it is a child's disease, that it prefers the female sex, that it is apt to recur, that it affects the arms, hands, and face more often than the legs, that it is more often both sided than one-sided, that complete recovery is the common rule, and death or any permanent disablement the rare exception and so forth. Whether, therefore, it be alleged that embolism, or thrombosis, or perivascular softening, or 'disturbance' in some motor centres, or 'toxic influence' is at the root of chorea, each of these conditions needs for its justification to be brought into relation and harmony with the known symptoms of the disorder it professes to explain.

Now, if this comparison be fairly made I think it will appear :—

1st. That there is no morbid condition as yet anatomically described which, so far as we have independent knowledge of it, is capable of producing symptoms at all similar to those of chorea.

2nd. That the hypotheses which, apart from demonstration, really provides the best for the actual phenomena of chorea, do

not in fact present any distinct picture of a definite morbid change.

3rd. That having regard to the special characters of chorea, it is difficult to conceive of any morbid condition whatever, anatomically demonstrable, calculated to produce it, or indeed compatible with it.

1. The morbid anatomy of chorea, or as much of it as has survived, begins, as we have seen, with its association with endocarditis,[1] an association soon to be supplemented and explained by the observations of Dr. Kirkes upon embolism in 1852. Taking, therefore, this, the most concise and ingenious of all the theories having a purely anatomical basis, we may inquire, in the first place, whether embolism, so far as we have independent knowledge of it, is capable of producing symptoms at all similar to those of chorea.

Now, the ordinary symptoms and course and cause of embolic obstruction are known. Making allowance for great diversity in the response to cerebral injury, as well as for modifications due to the extent, size, and site of the plugging, our actual information under these headings may be summed up generally as follows:— (*a*) For *symptoms*: a sudden vertigo or an acute head pain, with faintness or sickness; a more or less complete hemiplegia; impaired intelligence and sensation; and, if the hemiplegia be right-sided (*as it most often is*), either aphasia or inability to utter articulate sounds. (*b*) For *course*: a gradual but interrupted decline, or an incomplete and precarious recovery; nutrition

[1] In speaking of the several anatomical conditions which have been definitely described as representing the material expression of chorea, it is unnecessary to refer again to doctrines which are now abandoned. Yet the observations of Dr. Bright in 1841 upon the connection between pericarditis and chorea have this singular value; they point to a connection which, although different in form from that which Dr. Bright asserts, is really implied in the evidence which his paper affords. There is reason to believe, as we shall presently see, that severe and fatal choreic convulsion is sometimes in direct relationship with endocarditis. It is in the highest degree probable that Dr. Bright's cases, although referring expressly to pericarditis, are in fact illustrations of this connection, inasmuch as the endocardium and the pericardium commonly suffer inflammation together.

changes in the muscles of the affected side; a special liability to recurrence of the first fit; often a fatal termination by way of coma. Such or such like clinical features of embolic cerebral obstruction are accounted for by reference to its morbid anatomy. Its usual seat, mainly determined by the distribution of the middle cerebral artery, is the left rather than the right side of the brain, while secondary softening is an early consequence of the original accident. (*c*) For *cause*: the conditions which belong to degeneration; to endocarditis; to acute rheumatism; and to the puerperal state. In other words conditions belonging to advanced life, or to the time between puberty and middle age.

Such, I say, is the general description of cerebral plugging, so far as it has been observed clinically and anatomically; and if the account have reference to minute embolism, we have but to add that there is often active delirium, high temperature, and a train of symptoms, rapidly fatal, which resemble most specific fever.[1] How far does all this apply to chorea; to a disease confined almost to childhood; favouring the female sex; preferring the left side rather than the right; seldom sudden in its access; hardly ever exhibiting aphasia, high temperature, vertigo or sickness; producing no special wasting of the affected muscles; implying little danger to life or limb, and apt to disappear at that precise period of life when, with the greater frequency of endocarditis and the setting in of degenerative changes, the liability to embolism and thrombosis is largely increased? Putting together all that we know of the plugging of cerebral vessels, large or small, in its symptoms, associations and subjects, it is directly opposed to all that we know in respect of chorea.[2] If it could be shown that this particular morbid condition was constantly present in chorea,

[1] See, for example, two cases of cerebral embolism reported by Dr. Dickinson, *British Medical Journal*, May 21, 1881, p. 795.

[2] The connection of chorea with acute rheumatism and with child-bearing may be alleged to the contrary. But the rheumatic connection, as I have endeavoured to show elsewhere, is rare, and in its nature peculiar; while the chorea of child-bearing, as Dr. Barnes has pointed out, is almost always but the revival of a former chorea in childhood.

the observation would offer a new difficulty ; we should still have to look elsewhere for the structural basis of the disorder.

But we have still to inquire upon what ground of actual observation this doctrine of vascular plugging in chorea depends. 'I am aware,' says a very candid and fair advocate[1] of this belief, 'that the morbid anatomy of chorea is not considered to lend much support to the attractive hypothesis of embolism.' Drs. Wilks and Moxon have never met with microscopic emboli in any instance. In one case where, together with chorea, hemiplegia had followed embolism, 'there were no discoverable emboli in the small vessels.' These authors are unable, indeed, to recognise any constant morbid appearance after death in chorea. Similarly Dr. Gowers and Dr. Ferrier have failed to discover emboli after diligent search. It is not too much to say that instances of minute embolism in association with chorea are conspicuous by their rarity. Cases of the kind, as those of Dr. Broadbent and of Dr. Tuckwell,[2] are quoted over and over again, but it is admitted that they conflict with the general experience. 'I have never seen an instance,' says Dr. Dickinson, 'in which the well-known blocking [of embolism] as found after death, has been conjoined in life with choreic symptoms' (*loc. cit.* p. 36). If this theory of vascular plugging is to be established, it must be, as Dr. S. Mackenzie admits, 'upon evidence of a clinical and physiological nature.' Where is such evidence to be found? It would appear, on the contrary, that the condition of minute vascular plugging, whether of embolism or thrombosis, is both insufficient theoretically, so far as our knowledge goes, to account for the special phenomena of chorea and, as a matter of fact, only exceptionally met with in connection with it.

The same may be said in part of the nervous changes pointed out by Dr. Dickinson, and shortly described in the last chapter.

[1] Dr. S. Mackenzie, *British Medical Journal*, Dec. 23, 1876.

[2] *Medical Times and Gazette*, 1875, p. 482 ; *British and Foreign Medico-Chirurgical Review*, 1867 ; St. Bartholomew's Hospital *Reports*, vol. v.

Although this condition, consisting in spots of perivascular degeneration distributed symmetrically throughout the brain and cord, was found wherever it was looked for (not only in chorea, but in diabetes as well), it is obviously not the kind of change we are seeking, and, being found, it is impossible, without a revolution in physiology, to reconcile with it the actual phenomena of chorea. How can these degenerated spots, symmetrically arranged, affecting the cord as well as the brain, and tending to ultimate destruction of nerve-substance, be compatible with a disorder which is transitory and often one-sided, and which almost always leaves the functions of the cord unimpaired? How, indeed, can those who appeal exclusively to anatomy to explain disease be content with but one set of changes for affections so diverse as disseminated sclerosis, diabetes, and chorea?

The difficulty has been felt and expressed. And accordingly, in place of a pathology which claims to have the direct sanction of anatomical observation, we are offered hypotheses which have been expressly framed to meet the conditions of the case, and which, while still insisting in part upon a physical change, eke out the rest by means of some of those general expressions imputing blame to the blood or the vessels which are so ready of service where demonstration fails. Thus, for example, we have Dr. Bastian's doctrine of chorea as being due to 'disturbed nutrition' of the corpora striata, 'issuing often in sub-acute inflammation of those centres, and characterised in part by the production of minute multiple emboli, a condition originating in an altered state of blood.'[1] Now, so far as the anatomical part of this description is concerned, Dr. Bastian himself calls attention to the scantiness of its direct evidence, and to the possibility of confounding what 'lies at the root of the disease with other hyperæmias more or less secondary in duration and mode of origin.' And for whatever is beyond such description, there are many difficulties in the way of accepting what is asserted in any definite sense. 'Disturbed

[1] *British Medical Journal*, p. 67, 1873.

nutrition,' indeed, is hardly a tangible expression, while any theory of chorea which needs the supposition of a blood-change is at once negatived by clinical facts. Chorea attaches to no special blood-state; it occurs to the plethoric as well as the anæmic; and all the 'blood-poisons' that we know of serve rather to remove than to excite it. Even in the case of acute rheumatism, which would seem at first sight to give shelter to some such theory, it is not until the active febrile stage of that disease has disappeared that the chorea comes.

And so by degrees, with the gradual substitution of hypothesis for observation, we come at last to theories which are *all* hypothesis, a mere writing out of the symptoms of chorea in technical phrase, where, although some morbid change or other is still implied, no attempt is made to reconcile the actual phenomena with any definite localised lesion. It is felt, indeed, that this task of reconciliation becomes the more perplexing just in proportion as anatomical description becomes the more explicit. It is easy to accommodate chorea to general expressions of altered nutrition and disturbed nerve centres; it is most difficult to accommodate it, even in theory, to any morbid condition whatever that we have actually seen, and of which we know the common course and issue.

Take for example the opinions of Dr. Hughlings Jackson, already quoted upon this subject. 'The great elaborateness of the movements in chorea' has led this author to the conclusion that the convolutions are the parts diseased. But if the character of the movements requires this assumption, what shall be said of their seat and variableness? With the supposition of diseased convolutions we are not only led to expect aphasia, mental disturbance, and 'head symptoms,' we have also to face the fact that very limited injury to certain regions of the cortex, whether irritative or destructive, will produce either spasm or paresis, and never chorea. In the list of cases which Dr. Ferrier has collected, there is not one which lends the slightest support to the belief that the

movements characteristic of childish chorea are among the consequences of any brain lesion as yet described or produced. But the disparity does not stop with the *character* of the movements; it extends to the particular muscles implicated in the two cases. In cortical lesions the leg and the arm are usually affected together, while in the few instances of exception, it is the leg that is affected first. It is notorious that in chorea the two hands or the arms and shoulders are far more commonly affected than one side or one leg.[1]

It thus appears that the pathology of chorea which really takes into account and satisfies the actual phenomena of the disorder, does so in fact by eluding anatomical description altogether. It may borrow its phrases; it is not restricted to what they imply. The gist of the explanation lies always in some convenient expression which we are bound to accept, but which is so little definite as to advance us nothing in actual knowledge. And in the last resort the trammels of anatomy are broken through, and the condition of the corpus striatum in chorea is described as one of *delirium*.

2. It is this that I mean in saying that the hypotheses which provide the best for the actual phenomena of chorea do not in fact present any distinct picture of a definite morbid change. Take, for instance, the late Dr. Todd's description already quoted, which refers chorea to a 'debilitated state of the system, which, with the aid of a peculiar diathesis, produces a more or less enfeebled nutrition, leading, upon adequate cause, to a disturbance of the centre of emotion.' Or take Dr. Handfield Jones's[2] statement (I do not profess to give it in full, but only with reference to the point in question), that the 'motor or emotional centres fall into a state of paresis.' Or take the several beliefs variously expressed of some 'toxic influence,' or of some 'eccentric irritation.' It would be impossible, I say, to deny the occasional relevancy of each of these descriptions; but how much are we the better for them? They are in fact but translations of what we see and know.

[1] See Appendix B. Analysis of Tables, p. 193.
[2] *Functional Nervous Disorders*, p. 361.

Wherever the voluntary muscles are beyond control, we may reasonably impute blame to the region which presides over movement. Wherever there is over-emotion, we may credibly ascribe it to a disturbance of the centre of emotion. Similarly, we may have 'toxic matter' and 'peripheral irritation,' and each of these in its own way may generate this same 'peculiar condition' which we call chorea. But observe that whenever these wholly metaphysical accounts of morbid influence and irritation can be brought fairly into the light, whenever they assign some definite pathological state, such as anæmia or some specified poison, then at once they can be met and confuted.

But it may be said the lesions of chorea are real enough, but from their nature 'they are not susceptible of anatomical demonstration.'[1] The symptoms are transitory and paroxysmal, and death comes too late to find any trace of them. In this respect, it may be urged, the disorder resembles epilepsy and other convulsive or spasmodic diseases, the nature of which must be investigated at the time and in the working. It must be answered that the actual physical conditions upon which the paroxysms of epilepsy or of nervous asthma immediately depend, if not known, are at least being hopefully sought for. Take the epileptic fit, for example. There are the materials to work with in the pallor of the face, the condition of the retinal vessels, the definite methods by means of which the fit may be produced or averted, and its frequent dependence upon direct mechanical pressure or the retention of particular elements of disintegration. And not only in disease but at will, by the drain of blood, by section of one of the lateral columns of the cord, or by irritation of the cerebral cortex, we can *obtain* epilepsy. Whatever the *modus operandi*, whether the brain be anæmic or hyperæmic, or first one and then the other, there is ample evidence of a profound vascular change of some sort. The symptoms and associations of epilepsy are definite and invariable. It has a recognised place in the category of diseases. Very different is the

[1] Dr. Hughlings Jackson, *British Medical Journal*, Dec. 23, 1876.

position of chorea. There is no known means of producing it artificially, and no known disease which (to say the least) is habitually associated with it; while as regards the condition of the cerebral circulation during the indefinite time that chorea drags on, we have proof, upon every test that can be applied, that there is no change of the kind that we are in the habit of recognising as morbid.

And even when anatomical expressions are abandoned, and recourse is had to more flexible language; when it is said, for instance, that the excessive movements in chorea are due to the same agency as those of epilepsy, namely, to 'discharges of grey matter, which, except for great irritability from over-nutrition, is healthy,' the course is not made much clearer. The same explanation can hardly be made to serve both for chorea and epilepsy. The explosive discharge by means of involuntary spasm (which is epilepsy) is quite different from that continuous restlessness and feeble consensus of the higher muscles seen in chorea, which is without spasm, and not wholly involuntary; which never occurs in sleep or without consciousness, and indeed intelligence; which no manipulation can produce; which is almost unknown with certain races of mankind, and never seen in the lower animals.[1]

Let it be granted, however, that 'an increased access of blood to a district which is embolised but otherwise healthy,' is, by what-

[1] Even could it be established, which it cannot, that choreic movement is a symptom of cerebral disease at all analogous to epileptiform spasm, we should have next to inquire whether the mode of onset and the sequel corresponded in the two cases. The fact is, that there is no such correspondence, but a marked contrast. This is enforced by the very same authority from whom I am now quoting—namely, Dr. Hughlings Jackson. Epiletiform seizures indicative of local brain disease begin in the thumb and index finger of one hand; the over-movement of chorea is in *all* the fingers, and generally of *both* hands. In the epileptiform seizure the lower part of the face is most affected; in chorea the upper part of the face generally. In epilepsy aphasia is common, and especially with affection of the right side; in chorea there is never aphasia, and the speech defect is in no relation to the side affected. After epilepsy there is exaggerated knee jerk on the side that was convulsed; after chorea there is nothing of the sort.—See Dr. H. Jackson on 'Epileptiform Convulsions from Cerebral Disease,' Medical Section, International Medical Congress, 1881.

ever agency, the cause of chorea, is such a condition really compatible with the phenomena it professes to satisfy? I maintain that it fails, both in respect of embolism and in respect of increased access of blood. Our knowledge of cerebral embolism assures us that grey matter thus improperly nourished soon disintegrates and softens. Allowing, therefore, that this form of embolism would give rise to chorea first, it would give rise to paresis afterwards. Chorea would not be the recovering disease which we see; it would be intimately allied with paralysis. Else the hypothesis which provides embolism as the cause of chorea, must provide something besides which shall presently dispose of such embolism.

But further, and apart from this difficulty, upon what ground is the hypothesis based that hyperæmia of grey matter occasions chorea? In the many forms of intracranial growth, syphilitic, tubercular, and sarcomatous; in aneurism; in meningitis; in the changes which precede softening; in the reparative processes after cortical hæmorrhage, a localised hyperæmia of grey matter may be assumed to arise at some time or other. The symptoms of these several conditions, as is well known, present the greatest variety. They include almost every kind of nervous disturbance except chorea: spasm, whether tonic or clonic, 'limited to the distribution of a single motor nerve or implicating a group of muscles on one side of the body;' emotional disorders resembling hysteria so closely as to be often mistaken for it; incoherence, mania, delirium, obstinate vomiting, acute pain, aphasia, but never (or hardly ever)[1] chorea. Especially is it to be remarked in the case of meningitis, a disease which both involves hyperæmia of grey matter and has children for its favourite subjects, that with all the variety in its symptoms (coinciding probably with a corresponding variety in the order of sequence of the morbid changes)

[1] I make this reservation in view of those individuals who have already suffered chorea in childhood, and with whom, as is well known, many provocations, and cerebral disease amongst the rest, will serve sometimes to revive the same affection.—See Case 4, Appendix A.

chorea has no place. There is nothing more remarkable, I think, in the general conduct of chorea than the way in which it keeps itself separate, not only from all those brain diseases which imply active trophic change, but from all active disease whatever.

3. And it may be contended generally, not merely that all the morbid conditions hitherto described fail to account for the phenomena of chorea, but further, that it is difficult to conceive of any morbid condition whatever, anatomically demonstrable, which is at all calculated to produce it. We have seen already by what course of reasoning the locality of the chorea change has been referred to the convolutions. But suppose we place it there, by what further supposition can any material defect of a tangible kind (more distinct and demonstrable, I mean, than 'mal-nutrition' or 'trophic disturbance') be assigned to this region of which it may be reasonably affirmed that it is calculated to provoke chorea? Look again at the actual facts, look especially at the points in which the chorea of every day differs from the chorea that is really wanted to satisfy anatomical theories. The brain cortex has by this time been injured and irritated by disease and experiment in a great variety of ways. It may be assumed that every kind of response of which it is capable has been elicited from it. It has been shown by the experiments of Dr. Ferrier and others that certain defined areas of the cerebral hemispheres have special endowments, insomuch that their stimulation is followed by particular movements or groups of move ments.[1] Thus we get complex movements of the several limbs like those of climbing or swimming, or walking; extension movement of the hand and arm; the combined movement of head, eyes, and pupils, which gives the attitude of surprise; and so on, each of these movements being, so to speak, under command of the operator, and producible always so long as the particular centre is structurally uninjured. Moreover, these several centres

[1] See Ferrier, *On the Localisation of Brain Injuries.*

of movement being all near together, and all included in that area of the brain which is in relation through the corpus striatum with the motor tract, movements of these various parts are apt to be variously conjoined, or the one kind of movement to precede or follow the other, just as the stimulation of one centre gets communicated to the next.[1] And from movements of a precise and definite kind which result from the earliest stimulation of a particular motor centre, we pass on to a corresponding spasm, and from that to a paresis, these several gradations corresponding with increased irritation and the production eventually of structural injury. It must be added that the earliest of these results, that of combined movement, is chiefly known to us in experiment, while the later consequences, spasm and paresis, are amply illustrated in cerebral disease.

Now, suppose some lesion or other of an irritative kind affecting the convolutions to be so situated as to concern some one or other, or some group of these motor centres. Upon the foregoing data, what consequence might be reasonably expected to happen? Surely that the earliest impression of such irritation should be seen in some definite muscular movement, or in a combination of movements corresponding with the propinquity and relative position of the several motor centres, the leg and lower part of the face suffering with the arm, the head and neck with the eyes so as to give a particular expression, and so on. Or if the irritation were limited to one centre, we should expect (arguing from every irritation of the kind that we know of) that it would at length produce spasm and paresis: that we should have for this particular motor centre at first extravagant movement strictly localised, presently spasm or tremor of increasing violence, and at last paralysis, just as the nerve deterioration proceeded.

[1] For the purposes of the argument the facts of localisation are here taken as established. I would refer the reader, however, to a paper by Dr. Brown-Sequard, read at the Medical Congress (*Lancet*, Aug. 6, 1881), entitled 'Experimental Facts, showing that the admitted facts relating to paralysis of cerebral origin, and to the physiology of the so-called motor tract, must be rejected.'

How far do the facts of chorea correspond with such expectation? I have already alluded to the anomalous and irregular manner in which the several parts of the body are implicated, the most sensitive and intelligent muscles being the most liable to attack; but what is more noteworthy still, is the character of the movements. Chorea does not consist in the frequent repetition of any one muscular act, or exaggeration of any particular bodily expression. Still less is it spasm. Choreic muscles are restless and jerky and indeliberate, they combine so badly that the intention of particular movements, whether of the tongue or the limbs, is not apparent, while, so far as the special muscles of expression are concerned, it is not the look of surprise that we see or of any other emotion, but mere vacancy. Chorea is, in fact, not absolute but relative disorder. The movement which is proper to the child would be accounted chorea in the man or woman. The movement which is fitting and convenient for one limb or feature would be chorea in another. Nay more, the movement which we learn to accept from one man we should call choreic in another. True, such examples as these fail to represent extreme chorea, but it is not extreme chorea that we at present want, but the common *method* of the disorder.

But there is another element of chorea much insisted on by those who are in search for its physical basis—namely, *ataxy*. Here, again, we have but to watch the thing itself to see at once how this word fails to apply to chorea in the same sense as it applies to the progressive disease which depends upon degenerative changes in the cord. A single example will serve better than any general description to make this clear. I take the instance of a girl of twelve, shortly described in Case 5 of the Appendix. Ataxy is very marked in this patient, but it is in the arms and speech muscles, and not in the legs. When directed to clap her hands together, she moves the two arms with a jerk, but in such manner as not only to fail of her purpose but to conceal the existence of any purpose whatever. And the more so, that there is no deliberate direction of

the eyes towards the arms, or to the place where the hands should meet. The movement is sudden and reckless and wholly abortive. So it is in the next attempt and the next. At last, however, by a sudden jerk, as if resolving to anticipate the perverted working of more deliberate will, the act is performed to perfection, the palms meeting quite accurately, while with this unexpected success subsequent movements of a similar kind are much improved. Every one will admit the contrast between this and progressive ataxia. The cautious and painful way in which an ataxic sets about any combined movement, the careful manner in which, with the help of the eyes, the hands are moved towards one another, yet just fail to meet, or meet by a happy chance, not fully, as in the other case, but with their sides touching, all this is as characteristic of the disease as is its progressive character, implication of the organs of special sense, preference for the lower extremities, and limitation almost to adult males. Add to this (if more needs to be added) that the ill consensus of choreic muscles is a very variable and intermittent affection. In the case just mentioned, with the confidence of success the arms very quickly regained their full use. Upon a mental disquiet, however (occasioned by an incautious comparison of her complaint, in the girl's hearing, with demoniacal possession), the ataxy returned temporarily, together with the full violence of the original disorder, and such extreme difficulty in mastication and deglutition that for some twenty-four hours she could hardly be got to swallow. All these symptoms, however, subsided in the course of a day or two with the quieting of the mind, and the girl eventually became absolutely steady.

I should be content almost to rest the whole case upon one such example as this, upon *any* example, indeed, in which the cause and course and termination and exact manner of chorea are faithfully and fully set down. If morbid anatomy will serve at one point, it will fail upon a complete review, and can only be maintained by having regard to certain isolated symptoms at a particular period of their development.

CHAPTER VII.

CHOREA A FUNCTIONAL DISEASE.

The parts selected by chorea—Its varieties and modifications—Character of its ataxy—Its form in relation to its cause—Alliance to hysteria and emotion—Manner of progress and of recurrence—Objections.

Morbid anatomy thus failing to account for chorea, we are led to consider the question of its pathology from a different point of view. May not chorea be looked upon as a functional disorder, a motor disturbance which is as much beyond the reach of anatomical demonstration as are the various passions and emotions which, like it, distort and coerce the body in a great variety of ways? This functional hypothesis will, no doubt, be rejected by some as a mere evasion of the difficulty, and I have already given such answer as I can to that preliminary objection. Assuming, however, that we may properly recognise certain varieties in the exercise of the muscular functions apart from material disease, the question still remains whether or not the phenomena of chorea are to be included amongst these varieties. We have seen that anatomical theories are faulty and inadequate. How far can any functional hypothesis take their place? It will need to be tested like the rest in the light of the facts, by considering, that is to say, the character of the choreic movement, its subjects, causes and associations.

It has been urged in the preceding chapter that the movements of chorea, in their method and mode of distribution over the body, together with the rarity of spasm or of paralysis, give no warrant whatever for assuming the existence of any definite morbid change. In their variety and half voluntariness such movements would

seem, as we have seen, to have their source in the cerebral convolutions ; yet not in convolutions diseased or disturbed in any of the ways which anatomy can discern. The limbs become subject to chorea in the order of their use as intelligent instruments, and not as they would do upon any assumption of injury or irritation of a motor centre. Thus, untaught muscles, and such as have never been employed as the agents of intelligence, never suffer chorea ; while, further, the more complex the muscular employment, the higher the place, so to speak, in the intellectual scale of any particular limb or group of muscles, the greater the liability in this respect. The arms suffer chorea much more than the legs, the hands much more than the arms, and the face (so soon as sensitiveness begins to settle there) more than any other part of the body.

Chorea thus indicates the withdrawal or infirmity of controlling power over certain parts of the frame, and will be seen, *cæteris paribus*, first and most in those muscles which are by nature (or, it may be, by some special acquirement) the most unruly. Its precise manner, at whatever age it may occur, is due to this : that the muscles concerned, having been educated more or less perfectly in certain kinds of movement, are suddenly thrown back in their education by some nervous shock which renders them restless and unruly, while the operation of the will no longer sufficing to regulate the limbs, tends rather to disfigure the movements it seeks to arrest. Yet the child thus disturbed does not return altogether to the method of infantile movement. There still lingers some memory of order, and the simpler uses of the muscles in their acquired conjunction are in a measure retained. But the capacity for stillness, which ought to develop *pari passu* with the acquisition of purposive movement, is enfeebled. Intelligent movement is for the while embarrassed, disfigured, and overborne by emotion movement. It is not lost, and under favouring circumstances will assert itself. A sudden access of determination or confidence, an effort which is purely mental, will bring the limbs for a moment

to order and quiet. But the habitual condition is one of weak restlessness when there should be quiet, and of exaggerated misdirected movement when some muscular act is required.

Hence it is that the deformity of chorea and its spasmodic character appear more and more as life goes on. In early childhood the over-movement is easily concurred in and hardly deforming, but in adult life, the will being in active opposition, the disorder exhibits a corresponding distortion and spasm.[1]

We are thus led to consider chorea as being no absolute thing susceptible of one general description like spasm, or tremor, or paresis, or any other of the clinical signs of nervous disease. It varies with its subjects. The child who has not yet acquired the full use of its voluntary muscles, whose movements are undecided and featureless, is the proper and, indeed, the only subject of that irregular and variable commotion which the books seek to describe. The mismovement is but an exaggeration of the natural movement of that time of life; a mere restlessness which is without character or rhythm. But when chorea comes to the adult, his fixed habits of moving will impart to the disorder a distinct method; the affected limbs, that is to say, are jerked about after a manner that may be described. The mismovement is more or less rhythmical, or there is a recurrent twitching of certain muscles in a constant order. And as life goes on, chorea presents these characters more and more, insomuch that we might guess with some accuracy the age of a choreic person without the aid of the features.

And along with these several modifications of chorea, regarding it as a motor disorder, there are others which concern its mental or psychical associations. In these respects chorea not only varies with the age and temperament; it is affected visibly

[1] Apart from chorea this same law is of universal application. Thus when, as often happens, the face muscles pass beyond control so as to express sentiments which it is desired to conceal, there results from this conflict a localised chorea, a chorea which has many degrees from the slight facial disorder which indicates that some restraint is being put upon the features to the absolute distortion of face which occurs when some violent passion is to be concealed.

by passing events, and may be of one form to-day and another to-morrow. In any moderate chorea, as was mentioned at first, if the attention of the child be expressly called to a particular limb, and she be bidden either to increase or to modify in any stated way the movement of that part of the body, the effect of such observation will always be to alter for a while the character of the restlessness. Similarly, the holding of one limb, in the moderate cases I am speaking of, will have the effect of transferring the over-movement to other parts of the body ; the restraint is never actively resisted.

The mental or psychical connection is seen still further in the *ataxy* of the affection. It is to be remembered, indeed, so far as anatomy is concerned, that morbid changes in the cerebral cortex do not provide for ataxy at all. But what I would notice here is that the ataxy of chorea, like its over-movement, is of that kind of which we get the pattern—I do not say the degree—not in structural disease, whether cerebral or spinal, but in the many conditions of mental excitement and perplexity to which all mankind are liable. A choreic child may fail utterly in some muscular act one day which it will accomplish easily the next. The very same purpose which cannot be accomplished when set about deliberately will be performed accurately on a sudden and without premeditation. Again, the observation of others has the effect sometimes of aggravating and sometimes of controlling choreic ataxy ; or it may have both these effects at different times in the same subject. In addition, therefore, to the very obvious distinction between the ill consensus of choreic muscles and the progressive ataxy of disease of the cord already alluded to in the last chapter, there is the further difference that the former is directly influenced by psychical causes.

It has been urged by Dr. Gowers that the 'inco-ordination of chorea is distinct from mere inability of the will to still the muscles,' and he thence argues that the independent variation depends on a morbid condition of distinct and perhaps separate regions.

But it is to be remembered that muscular co-ordination and the power of muscular stillness do not commonly vary together. There are many habitually restless individuals who will at once bring their muscles into order when employed on some familiar task. There are others, still and reposeful so long as they do nothing, yet painfully wanting in co-ordination when set to work. In so far, therefore, as chorea may properly be said to depend upon a mere exaggeration of defects which we all exhibit in some degree or other, the particular manner of its ataxy, as contrasted with its restlessness, is just what we might expect.

A further argument in favour of the functional hypothesis of chorea may be drawn from the observation of its actual starting place.[1] In young children, the hands (one or both, but the right much more than the left) are in a large number of instances the parts first disturbed. Now it is obvious that in childhood there is no member of the body more heavily taxed than this. Considering the modern requirements of education, the hand of the child may be said to be habitually overstrained. And accordingly, without obvious nervous shock or previous rheumatism, we get hand chorea in children, an affection almost limited to them, and the cause of which is regarded as very obscure. All such examples, however, receive their explanation, if we will accept the doctrine that the work and competition of school may furnish occasion for mental disturbance which finds expression in the part most exercised.

Other examples may be quoted which tend to show that, along with the general law which makes the muscles of the highest endowment the most liable to chorea, there is a tendency on the part of those muscles which are the most directly beset or embarrassed to suffer the disorder first and most. The operation of this principle is seen generally in the successive modifications which chorea undergoes at the several periods of life, the limbs often suffering alone in childhood, and so long as they are freely made

[1] See Appendix B.

use of, in emotional expression ; while at a later stage, when the face comes to be a conscious index of the feelings, it is the facial muscles which are the most disturbed. It is seen also, individually, when the particular event or catastrophe which occasioned the chorea happens to concern a particular group of muscles. A boy of eleven was much alarmed by an explosion of gunpowder, which slightly scorched his face, and was followed by choreic twitching of the eyelids. A girl of eight and another of ten, having accidentally pinched the fingers of one hand, became choreic in those fingers. A boy of eight gets chorea of the hand in which he was holding the reins of a runaway horse. A girl of eleven, stooping to pick up, as she thought, her brother's cap, found to her great alarm that she had seized a dead rat : she became choreic in the offended hand (the right), and so markedly that, although the general chorea which followed was not severe, this one member for a long time after could by no effort be kept still.[1]

Similarly I have noticed repeatedly chorea originating on the side whence the alarm comes. A boy frightened by a dog jumping up at him gets chorea on the side of the dog's approach ; a girl frightened by a man suddenly starting out upon her in the dark gets chorea of the side exposed, and so forth. A very large number of cases would of course be needed to verify the hypothesis which these examples would appear to illustrate ; but I think the number might be found, while the principle itself is no other than that of which we have familiar knowledge, in the after agitation of muscles which have been strongly excited, and their

[1] I mention only cases of my own. There are many others. Ziemssen relates a case of violent chorea of the legs reaching great height in a few hours, occurring in a boy, owing to fright, from a gun being fired behind him when he was gathering hops.—*Cycl.* vol. xiv. p. 432.

It is to be observed of these instances and of others like them, where chorea is caused by some grave terror, that, contrary to what may be regarded as the rule of of the disease, there is hardly an interval between cause and effect. I would refer to the table of cases in Dr. Dickinson's paper, pp. 30 and 31, *Med.-Chir. Trans.*, vol. lix., where will be found six instances of chorea due to sudden terror and immediately following it.

tendency to recall the violent movements or spasm of the moment of passion.

And observe that in the most violent chorea the muscles still maintain their accustomed concert. The muscular over-movement, except for its exaggeration and disregard of the will, is the same as the natural movement. Putting aside the paresis which is sometimes conjoined with chorea, it is not true to say (as has been said) that it will select certain muscles out of a group, and move them after a manner of which mere will is incapable. That this conjoint action of the muscles remains intact is shown especially in this, that in those parts of the body where the several muscular uses are most distinctly differentiated, there, in exact proportion to the degree and perfection of such differentiation, do we find a more or less perfect separateness of choreic movement. Thus, for example, the hand and the fingers are concerned in many tasks in which the arm takes no direct share. And the hand and the fingers are often choreic without the arm. On the contrary, the simple movements of the foot are commonly those which it shares with the leg. Foot movements alone are as rare as foot chorea alone. It is the same in regard to the two sides of the body. Movement of one arm is common enough, without need or suggestion of movement in the other ; but the movement of one leg almost implies movement of the other. Accordingly, chorea of a single arm is very common, and chorea of a single leg is very rare. But most of all do we find this rule exhibited in the face. One-sided chorea of the face is the exception ; one-sided paralysis of the face is the rule.

But we have yet to consider chorea in its connection with mental disturbance, hysteria, delirium, and mania.[1] Ziemssen, indeed, is content to refer 'the deterioration of intellect to

[1] It is sometimes asserted that there is a connection between chorea and epilepsy (p. 29). I have already alluded to that pathology which would ascribe the phenomena of both affections to a common cause. That epilepsy does not as a fact predispose to chorea may, I think, be safely admitted upon the evidence of the tables in Appendix B, where there is no single instance of the kind.

slight anatomical changes in the central apparatus of the nervous system.' But such an explanation, indefinite as it is, will not serve. For there is both more and less than deterioration of intellect to account for. Thus many patients with severe chorea escape cerebral symptoms altogether; the liability to such symptoms is governed by the age; and the mental disturbance, varying independently of the motor, is of all degrees, from slight emotional display to acute mania. Any account, then, of the mental phenomena of chorea which shall connect these invariably with its motor disorder is contrary to the facts. What has to be explained is this: that chorea in the child is usually a purely motor disorder; that mental disturbance comes to mix with it at and after the time of puberty, and that the two sometimes combine and sometimes alternate.

This gradual intrusion of the emotional element, the transmutation, so to speak, wholly or partially with the progress of life, of a motor into a mental disorder, is a phenomenon which finds ample illustration in other affections, and especially in hysteria. In the hysteric fit there is often a sudden and complete transition from the sighs and tears which first announce it to the violent convulsion which at once dissipates it, or else is again exchanged for emotion. At one time the hysteric fit will be purely motor, a convulsion or relaxation of the whole frame; at another it will be purely emotional, a burst of laughter or of weeping, or of these two combined. It seems, indeed, to be matter of indifference as to which of these modes of relief shall be employed.[1]

[1] In later life, and when chorea is almost impossible, these emotional displays become painful and difficult. Tears and laughter and spasm no longer come readily as convenient avenues for feeling. Yet there is still a motor equivalent, or exchange for emotion, which is not less obvious to those that look for it than chorea or hysteria. It consists not in over-movement or spasm, or any of the violent muscular displays which are associated with early life, but in some slight over-tension or relaxation of certain muscles, in a less erect posture of the body, an immobility or changed expression of the face, or, it may be, an alteration of the whole carriage. Changes like these, I say, are less striking than the others, but they are more abiding, as is the state of mind that provokes them; and at any time they may attain a degree of prominence which shall secure for them the equivocal name of disease.

But the manner in which the voluntary muscles are put to use, both to express and take the place of emotion, is best seen in childhood. Childish grief is actually dispelled by means of movement, and conversely any violent bodily exercise will always bring children to the verge of emotion. A little child, reserving as long as possible the motor expression of its grief, will suffer acutely in mental respects ; presently a slight quivering of the body, with catching of the breath, and irregular or perhaps suspended respiration, will indicate the approach of the required relief, which will come at last in the violent convulsion which we call sobbing, together with free movement of the limbs, and soon perfect mental serenity. In such familiar facts of our nature, as it seems to me, not only do we find the real clue to the various ways in which the mental phenomena of chorea associate themselves with its motor disorder, we learn besides why mere restlessness should be the particular mode of such disorder almost exclusively in early life.

From considerations such as these, suggested by the method and movements of chorea, we may pass on to those which concern its progress and mode of development. Chorea is usually separated from its exciting cause by a distinct interval. In many instances, however, this interval is more apparent than real, and arises from the fact that the disorder is of very gradual development, and fails at the first to attract notice. Yet so soon as it is once recognised, whether by its subject or by those about him, it rises at once into prominence. From this point its progress and duration are extremely variable. Sometimes the patient's first consciousness of his infirmity coincides with the height of the disorder, and after a short interval when both the disease and its treatment have become familiar, the over-movement begins to decline. In some severe cases with the elder patients it will thus moderate with remarkably rapidity. With very young children, however, the course of chorea from the time of its first recognition is one of continual ups and downs, dependent upon trivial circumstances of health, and spirits, and occupation, until at last and quite

suddenly an unusual improvement is noticed, from which time the progress to recovery proceeds rapidly and continuously. Yet even now this favourable progress may at any time be arrested by a mental shock, and the patient thrown back to his worst state, or it may be to worse than that.[1] This uneven progress, with the striking manner in which the first distinct sign of amendment becomes the foothold for further recovery, is among the many characteristics of chorea testifying to its real nature. Not less pertinent towards the same end is the long-enduring chorea of young children, where the patients are both indifferent to their disorder and incapable of applying the effort or attention necessary for its cure.

But we are to notice further that as life progresses the time presently comes when we are finally secured against chorea. As with experience and use the voluntary muscles acquire variety, so do they acquire stability, and thereupon lose the infirmity of child hood. They become less and less subject to chorea, not because they have escaped any of those liabilities to embolism and nervous deterioration which are said to produce it, for these liabilities are every year on the increase, but because variety of employment implies muscular accuracy and obedience. Thus there is nothing which so certainly removes the individual from the influence of chorea as education and culture. The more nicely adjusted are the several uses of the higher muscles, or, if the phrase be preferred, the more distinctly differentiated the functions of the cortical centres, the greater is the power of control.

And not merely does age with its fixed uses deliver the body from the assaults of chorea, but further, the several departments of the muscular system escape from it one by one in the order of their education. Thus, for example, the higher employment of the fingers in writing, sewing, and the like, are neither self-taught nor self-evident. There is nothing in the natural wants of childhood to suggest the way to them or to recommend their employ-

[1] See, for instance, Case 5, Appendix A.

ment. Yet after a while the time comes when these intricate movements are performed as readily and automatically as any. They become then as fixed and unvarying as the rest of the muscular habits. I write on this page with as little thought, except at this instant, of the complicated shapes I am forming, as I shall presently give to the movements of my legs in walking down Bond Street. And now, with the hand and fingers brought under the very same subjection as the lower limbs, they are protected, or in large measure protected, against chorea.

And what is true of the hand is true also after its manner of other parts. So long as the tongue or the face or the speech muscles are being taught and gathering experience, so long do we hold precarious possession of those parts of our bodies. But when long use and constant repetition have made the higher bodily movements, each in its proper turn, as natural and spontaneous as the movements of the legs in walking, we begin to hold them with something like the same security. And at last with the completion of the muscular education, a stage which is never reached except in company with superior intelligence and mental stability, chorea becomes altogether impossible, be the pathological conditions what they may. Overstrain, fatigue, and other influences directed against the voluntary muscles do not cease to be injurious, but the nature of the response is different. Just as the overworked hand of the school-girl suffers chorea, so the overworked hand of the law-writer suffers palsy or trembling.

Again, what hypothesis except the functional one can be made to provide for a disorder which is recurrent as chorea is, recovering perfectly time after time; and at last, when adult life is reached, finally disappearing, the signal for this departure being nothing else in the world but the departure of childish ways and the substitution of new modes of response to nervous impressions? And observe that during the time that this liability to recurrence continues, it is not the same muscles that are implicated in successive attacks, but rather those which are similar when regarded as in-

tellectual instruments. The manner of the repetition does not accord with any notion of disturbed nerve-centres influencing particular groups of muscles ; it accords with the more assured observation that intellectual and emotional expression makes use of different muscles at different ages. Thus the recurrence of a childish chorea in adult life will not necessarily be an exact repetition of it, although in obedience to exactly the same law. The muscles which at the time are the most sensitive are again the muscles which suffer. A further principle is involved in the case of chorea happening repeatedly to the same side, if not to the same limb. The fact may seem at first sight to need some anatomical explanation, but no one will deny that muscular failures and inco-ordination of whatever kind are long retained and easily recalled. In the articulation of certain words and the performance of certain manual and facial acts the same infirmity of a particular group of muscles will appear again and again, however long and complete the interval between one attempt and the next. To say that the muscles remember, and that the same muscles are repeatedly disturbed owing to the repetition of an old impression is, I am aware, only to say that the first impression has wrought some change or other in the brain, but it is a change to which at present no material conception attaches.

To these arguments, drawn from the nature of the choreic disorder, its variations with age and with the mental condition, as well as the manner in which it originates, progresses and recurs, others may be added having reference to its exciting cause and favourite subjects. Of the immediate causes of chorea there is none than can be put into comparison with fright. And not only in actual frequency does it stand first, it is superior to all the others in the manner of its association with the disease it occasions. We are invited to accept rheumatism as the cause of chorea, whatever the interval separating the two ; and as a matter of fact, as I have shown, they are seldom actually consecutive. But in the case of fright there is often no interval whatever. Now,

if it be admitted that fright is an efficient cause of chorea, as no one can for a moment doubt who reads the records of it, it is at least highly probable that other forms of mental disturbance operate in the same way.[1] In such cases the provocations to chorea that lie in the way of children in their schooling and unequal association with others older and stronger than themselves are very numerous. I do not suppose that mental disturbance is *always* the cause of chorea, yet if that were so we should hardly expect it to appear in a larger proportion of cases than we find. Children suffer from many terrors which they cannot explain,[2] both sleeping and waking; and apparently spontaneous chorea is probably not more frequent than that sudden and causeless change of disposition which young girls sometimes exhibit at an age when there are no developmental changes to account for it.

And the associations of chorea need the same interpretation as do its other characters. There is no condition which is so intimately connected with it as hysteria. The two affections, although properly separate, have so much in common that the very same symptoms which we should call chorea in the child we often call hysteria in the woman; while not seldom the motor and the emotional infirmity are so combined that we see in the same subject now one and now the other the more prominent.[3]

[1] Just as the particular movements of chorea are confined to the human race and need for their display a wider range and complexity of movement than other animals enjoy, so are its causes similarly limited, depending as they do upon superstition, a quick apprehension of danger, mental application and reflection, and other conditions beyond the reach of brutes.

[2] Pondering these matters in a crowded thoroughfare, I witnessed an incident so apposite to my thoughts that I am induced to relate it.

A man in charge of a child in a perambulator was looking in at a shop window when a passing dog put his nose into the child's face, causing it to scream with terror. The man, hearing the cry, looked round to see what had happened, but not until the dog, finding his attentions unwelcome, had disappeared round the corner. Now, supposing this child became choreic, no one but myself and the dog could guess at the cause.

[3] It is interesting to notice the attitude of pathological anatomy towards hysteria as contrasted with chorea. The following is from Jolly's article on Hysteria in vol. xiv. of Ziemssen's *Cyclopædia*, p. 488:—'That some alteration in the nature of the nervous system must be at the foundation of its altered function can-

For such reasons as these I am content for the present to regard chorea as a disorder of function. Some structural basis it has no doubt, like all other movement, orderly and disorderly, mental or bodily; but in its ordinary dress it displays none of those symptoms which we have succeeded so far in associating with any material morbid process whatever. If it is to be grouped with other disorders it must be with those which, like it, are transient and recoverable, and which attach themselves in turn to each period of life. To explain or rather to classify chorea I would look beyond it. Especially I would look to that multiform disorder whose physical basis has yet to be sought, and which at the next epoch of life, when in its turn the emotional part becomes unduly prominent, is apt to arise in the same sex and the same temperament, and upon similar incentive in strict parallelism with this motor disorder of children.

not be doubted. But whether we are to expect that these changes affect the structure of the nerve elements, or only have reference to its chemical and molecular constitution, cannot yet be stated. It is quite as possible that the microscope may at some time give us information concerning the nature of this condition, as it is that no information may be derived from this source. One can, therefore, in the meanwhile only discover the basis of hysteria in an "abnormal" condition of the nervous system, which can only be determined by its symptoms.' Thus we have, as at present advised by pathological anatomy, a delirium of the corpus striatum to account for chorea, and an abnormal condition of the whole nervous system to account for hysteria.

CHAPTER VIII.

CHOREA A FUNCTIONAL DISEASE—(*continued*).

Some objections considered—The duration of chorea in relation to its cause—Duration at various ages—Chorea found in association with structural lesions—The effects of chorea to be distinguished from its cause—Chorea in its ordinary form as a child's disease incompatible with structural disease—Various modes of expressing existing knowledge in reference to the pathology of chorea.

AGAINST such arguments as those of the last chapter certain objections are raised, some of which I have already mentioned, and some which, at the risk of being wearisome and of some necessary repetition, I would briefly notice in this place. They may be classed thus :—

1. Chorea is an enduring affection which often does not even commence until its supposed cause has ceased to operate.

2. Chorea occurs in connection with paralysis, convulsion, and other similar phenomena indicative of cerebral or nervous lesions, if not uniformly, yet too often to admit of the supposition that the connection is accidental ; while, added to this, chorea ending in death actually exhibits definite morbid changes, endocarditis as a very general rule ; nerve changes, such as minute emboli and softening, in an aggregate too large to be neglected.

1. As regards the *duration* of chorea the facts are these. It is apt to be much lengthened out in young children, is of somewhat shorter duration in those that are older, while at the puberty age, or when connected with pregnancy, it is severe but not long. In later life and in old age it is a permanent, incurable disorder.

Now, if the account I have given of the circumstances which attend chorea be a true one, these several modes of it are not un-

accountable. In childhood, as we have seen, the muscular system, disturbed by some nervous shock, degrades from the orderly movement which education was developing towards the aimless irrepressible movement of infancy. And if this be so, what is the probability of an immediate restoration? From what source is that extra power of control to come which will enable the child suddenly to quell such a disorder as this? From nothing that I can think of except that gradual strengthening of the will which comes naturally with development. Children do not immediately recover from chorea; young children, unable or unwilling to make an effort on their own behalf, retain the disorder for a considerable time, yet they all recover eventually, while the circumstances promoting or retarding their recovery clearly indicate its mental dependence. The growing power of the will together with the natural decline of childish restlessness are pledges for ultimate relief.

In the chorea of grown-up girls and young women the conditions are somewhat different. There is a disturbance of mind as well as of body. Both are on the side of disorder. The muscular agitation provokes and maintains a corresponding emotional excitement. Yet such chorea, although severe, is not often prolonged. Excited sometimes by pregnancy, and sometimes by the arrival of the catamenial period, it also, like the other, has security for its ultimate cure in the temporary character of the conditions to which it owes its origin. The chorea of the puerperal state, indeed, as Dr. Robert Barnes has pointed out, has for its subjects women who have already suffered chorea in childhood, and in whom the occurrence of pregnancy so elevates the emotional element as to render their power of control once more, and for the while, inadequate.

It is otherwise when we come to consider chorea in adult life and in old age. But the same reasoning applies to these as to the others. Chorea may persist with the advance of years, because the childish mind persists, and that extra will-command

which we expect with the natural development, and to which we look always for the cure of chorea, never comes. Or otherwise chorea may happen when life is already advanced, but only to those who are intellectually weak, or who from age have come to share the infirmities of childhood. But come as it may, it is obvious that the chorea of adult life has not the same hope of recovery as that of an earlier period. There is no reinforcement of will-power to be expected. The disorder has gained ascendency over the individual at his best, and there is nothing in the man's future as in the child's likely to dispossess it.

2. But it is said chorea occurs in connection with hemiplegia, convulsion, and endocarditis,[1] symptoms which appear to depend (and indeed in the fatal cases are commonly found to depend) upon definite structural lesions. The statement must be admitted, but it is incomplete. We have to add that chorea occurs much more often without these accompaniments than with them. And further that the circumstances of these exceptional cases forbid our accepting them as illustrations of the pathology of chorea *per se*. Chorea as a rule occurs by itself. In its common form it is a temporary affection of childhood which neither wastes the muscles nor paralyses them, and which disappears when childish habits have subsided, leaving no trace behind. But we need not stop here. Let us consider the actual significance of those examples in which chorea and paralysis are so associated as to appear due to a common cause.[2] All such examples in respect of the evidence they furnish of morbid change have this fatal objection, that they exhibit not chorea merely, but chorea disfigured owing to its combination with something else. These additional symptoms furnish, it is true, extra material for determining the precise sort of lesion in each particular case ; they do not help towards determining the pathology of chorea, nor can they be ac-

[1] In so far as the question concerns the heart, I must refer the reader to Chapter III.

[2] See, for instance, Case 4, Appendix A, with the remarks there appended.

cepted as illustrating it.[1] We are in fact in this dilemma, that so long as chorea exists alone it furnishes of itself no sufficient ground for asserting any such morbid change as anatomy would recognise ; while so soon as other symptoms are superadded, these so complicate the matter as to make the proper post-mortem signs of the simple affection extremely difficult of separate recognition.

We know, indeed, perfectly well that brain lesions of whatever kind do not, as a rule, exhibit chorea at any part of their course, and conversely, that chorea implies no appreciable liability to cerebral disease. Nay more, the nervous symptoms, such as sickness and partial convulsion, so readily excited in young children, are but seldom seen in connection with chorea. Yet with all this it is perfectly consistent with the hypothesis I am advocating, that the first signal of a trophic brain-change in a child or predisposed person should appear in that exaltation of movement which we call chorea, just as it may appear in that emotional exaltation which we call hysteria. The actual fact is, as has been said, that all the morbid conditions of the nerve centres that have been recognised are much more often without chorea than with it, yet *any* disturbance, even such as is not directly cerebral, may revive or even produce chorea.

But while we properly insist upon keeping the pattern of simple chorea distinct and separate, there is reason for believing that this purely functional disorder may of itself in some rare instances so affect the nerve centres as eventually to involve other parts of the body besides those at first concerned ; or otherwise (although the pathology of senile chorea gives little support to such a view),[2] that the long continuance of motor disturbance may ultimately give rise to actual structural deterioration of the centre on which such movement depends. It is difficult, without the aid

[1] See, for example, Dr. Tuckwell's cases, *Med.-Chir. Review*, Oct. 1867, and Bartholomew's Reports, vol. v.

[2] See Charcot on Chorea in Old Age, *Med. Times and Gazette*, March 9, 1878.

of some such hypothesis to account for facts like the following. Chorea beginning in one arm may be presently seen in the leg of the same side; one-sided chorea may be converted into convulsion or hemiplegia of the same side, or the converse may happen; a choreic limb may eventually become distorted owing to contraction of the flexor muscles.

Again, although the functional hypothesis seems sufficient, as has been said, to cover most of the examples of permanent chorea, it does not account for them all. Chorea may commence in a child with the ordinary symptoms, and go on indefinitely until the patient is eventually worn out and killed by persisting clonic convulsion.[1] In such instances, both in the duration and the gradually altering character of the affection, we seem to recognise a purely functional disorder at first, and something more than a functional disorder afterwards. The pathology of such cases is confessedly obscure and it can serve no purpose to speculate about them. Yet the more we lay stress upon the few instances of chorea having such issues as these, the more we bring into prominence that general law of the disorder which exhibits it as a harmless and temporary affection, wanting in all those symptoms which imply irritation or destruction of nervous structure.

And when all the instances of chorea ending in death and associated with structural changes have been eliminated, by how much do we diminish the sum of the affection? The movement derangement of ordinary chorea endures for a while and then disappears. That is the short account of the disorder on which we have to build; the condition of the living patient supplies all the material for analysis we are ever likely to possess, and this in so absolute a sense that the event of death, which alone could give us access to more, would at the same time impart such an element of exception as to forbid our drawing conclusions from that particular case.

Let us return once more to consider what this chorea of child-

[1] See Chapter IV. p. 75, and Case 15, Appendix A.

hood really is, an affection without paralysis and without spasm, and often with no disturbance whatever of the general health. The symptoms are not those of disease but of exalted function, and their recurrence many times in the same subject and the same limbs with no ultimate harm, gives conclusive proof that these repeated visitations are not destructive. Chorea, in a word, for its full development requires the service of a brain and cord structurally uninjured, and so soon as textural injury intrudes it will alter its proper form, and give room to some one or other of the recognised symptoms of nervous disease.

It remains only to consider how such conclusions as these may best find expression. There is an ample vocabulary now at the disposal of everybody, by the use of which it is easy to bring many ill-understood nervous conditions within physiological range. Impaired nutrition of nerve-centres ; disruption of the normal relations between such centres ; excessive, defective, or misdirected nervous discharge by cells of some particular part of the brain cortex, these and similar expressions, in so far as they have a precise meaning, may find ample justification some day. For the present I venture to doubt whether such phrases advance us much in any knowledge of chorea which may be put to practical use. Far more is accomplished, I believe, towards that end by directing attention to the near alliance of chorea with those emotional disturbances of which both the origin and the remedy are universally known. This done, we may await with patience whatever new light the future is destined to throw upon the structural basis of recovering diseases of this class, satisfied that no information of the kind will ever discredit that rational method of treatment which applies to all functional nervous disturbance and has the sanction of the common experience.

CHAPTER IX.

THE TREATMENT OF CHOREA.

Indications to be fulfilled—Removal of intestinal or other irritation in young children—Rest—Signs of debility as indications for treatment—Change of place—Drug remedies—Treatment of acute chorea—Chronic chorea—Convalescence.

THE foregoing inquiry, with its negative rather than positive conclusions, will have missed its main object unless the great principle of conduct which it has been intended to enforce has been made apparent. Yet while I am content that what has been written should stand by itself to be judged and applied by the reader, I am unwilling either to disappoint those who are in the habit of turning first to the end of a book for some account of its practical conclusions, or to give a handle to the statement that it is consistent with the whole scheme of this work that the chapter upon treatment should be left out. I proceed, therefore, without waiting to describe the old methods of cure or entering into details unsuited to those I am addressing, to consider the indications for treatment, the particulars of such treatment, and the prophylaxis or way of avoiding chorea.

In discussing the treatment of any disease the actual limit of reasonable expectation in that respect is apt to be disregarded. There is always a yearning towards some such curative effect as if deliberately expressed would often be seen from the nature of the case to be impossible. By a wholesome preservative instinct we are unwilling to concur in disease in any degree whatever, or to say of any treatment, short of that which would rid us at once of what is

felt as intolerable, that it is enough. And so in regard to chorea. No one who has studied its history will deem it reasonable to expect that such an affection can be suddenly arrested. All experience and all analogy tend to show that recovery must be gradual, and that the object of treatment is to bring it about as rapidly and securely as possible. And the same study of the disorder will certainly bring the further conviction that the time necessary for recovery cannot be precisely stated, depending as it does upon the age, temperament, and aptitude for treatment of the patient. The utmost reasonable expectation, I say, in regard to chorea is that under our methods it should begin to mend, and ultimately altogether recover, and that this should apply to the severe cases as well as the less severe.

Now, the precise nature of the task before us is of this kind ; it is not so much to check movement as to regulate it. By medicinal means it is possible no doubt to obtain a partial and temporary stillness, but this is only a rough counterfeit of that stability we have to seek. The actual 'indications' of treatment are not to be met in that way. Muscular stillness and ready consensus in movement can only be obtained by developing that power of self-direction which is naturally feeble in childhood. The main object to be kept in view is to stimulate self-confidence. Instead of being openly mistrusted and having attention called to their defects, which is the inevitable result of any formal and systematic treatment, these patients need encouragement and easy allowance. The great principle which underlies this method of cure—for so, as I believe, it deserves to be called—is familiar to everyone. It is the principle which makes success easier when some degree of it has been already attained, which makes the knowledge of help being at hand almost as good as help rendered, which makes the confidence of others a distinct reinforcement to self-reliance, which makes moral support material support. *Possunt quia posse videntur.*

The first need of chorea is *rest.* Even a moderate chorea in

its early stage needs to be kept in bed. The diet should be liberal but not unrestricted, and in the case of young children one meat meal daily is sufficient, the rest being made up with milk, milk puddings, whole meal bread, weak tea and coffee, &c. There is an erroneous notion in some quarters that choreic children can hardly be overfed.[1]

What remains concerns almost solely the mental or moral treatment of the patient, and will vary with the age, temperament, and intelligence, as well as with the degree and kind of chorea, and the time it has lasted. In the case of young children careless of their infirmity, who are able to control their limbs but prefer to be restless, choreic movement must be taken for a sign either of some nervous overstrain, or it may be of some material irritation. The presence of undigested food or of round worms is associated with such chorea often enough to make necessary special inquiry upon these points, and to commence treatment with moderate purgation, and it may be to employ santonin as well. That done and the condition of the gums ascertained, these children, carefully guarded against undue excitement, must be left to their own natural recovery, which is likely to be slow, but almost certain (in the absence of mental defect) to be complete. Not good but harm is done by any open notice; and there are many indirect means of encouraging bodily quietness which will naturally occur to every sensible mother or nurse. Confidence as to the result, and patience to wait for it, without injuring the child's health with drugs or its temper by scolding, are, I believe,

[1] It is a common direction of the books in regard to the treatment of chorea 'to improve the general health of the patient,' and a common statement of theirs that the general health of choreic children is usually impaired. Such is not my own experience; but however this may be, it is surely unnecessary to say that if the child show sign of illness that sign is not to be disregarded, be there chorea or not. I may go further and say that no child exhibiting chorea ought to be altogether removed from medical inspection, and that while the general principles of its treatment might, in my opinion, be very widely taught to parents with very great advantage, they are not safe to be trusted to make the best application of such knowledge to particular cases.

the two main rules of conduct in chorea happening at this early period of life.

With the older children it is somewhat different. Some of these will too readily concur in their bodily mismovements; others again are needlessly distressed by them, and some have lost for so long the proper muscular use that they have to be taught afresh. With but one principle in view, each of these classes, it is obvious, will require a separate treatment. At the outset, or rather on our first introduction to a case of recent moderate chorea, the main consideration is to establish a fitting relationship, if I may so speak, between the child and its disorder, sometimes neglecting the bodily mismovement, sometimes even approving it, and sometimes taking special precautions to set the mind at rest in regard to it. It is seldom at this early stage that any direction to the patient to control over-movement is of service. Muscular propriety is never so difficult to preserve as when care is taken about it with the knowledge that it is being overlooked, and the apprehension that failure will entail some kind of penalty. There is no nicer point, I believe, in the whole scheme of treatment than to know exactly when to make direct appeal to the child's own volition so as to ensure that its first active exercise of will shall meet with the success which is to strengthen, and not the failure which is to enfeeble it. The observation of the disorder will be continually teaching how much its progress depends upon trivial circumstances of its own providing, how well-bestowed praise or some special motive to be quiet, or the attention pleasantly arrested, will procure a quite sudden amendment, and how by the help and encouragement of this progress a fresh step is made towards recovery.

We have further and specific guides to treatment in the condition of individual muscles, in the body temperature, the sounds of the heart, and the state of the circulation. Muscular paresis, or debility, is, as we have seen, often associated with chorea and often the sequel of it. The temperature of the body after the first week

is apt to be habitually subnormal. The rate of the pulse may undergo frequent variations; the impulse of the heart may be short, knocking, and abrupt, and the closure of its auriculo-ventricular orifices from time to time incomplete. All such signs indicate the need of tonic remedies, and the best of such remedies, at a comparatively late stage of the disorder, is change of place. The special benefit which children derive from pure air, and especially from sea and mountain air, is here combined with that change of associations and surroundings which is best fitted to break the monotony of the complaint. But while change of place, if adopted at the proper time, is commonly beneficial, there are other and more violent changes which are commonly injurious. New companions, strange attendants, life rendered either irksome or exciting are so many hindrances to the natural course of recovery. What we seek is an even life without monotony, employment which shall give interest without fatigue, the repeated promise of recovery, and notice of every improvement.

It has been said already that the progress of chorea is not accurately described by saying that it gets gradually worse and then as gradually better. Very commonly there is a period—a day or an hour—of which we can say that in it the disorder is got under, not finally vanquished but mastered for the time. And in this uneven course many incidents occur of which we may avail ourselves for the service of the patient. Thus the power of walking, which may be completely lost even with moderate chorea, is often regained very quickly, and not by slow degrees, as with the other limbs. Of such improvement the child should have the full benefit in being allowed extra freedom for pleasurable exercise.

And here it is impossible to disregard the plain teaching of nature as to the bodily circumstances which serve to strengthen or relax that muscular control which is always variable. Hunger and fatigue and passing illness act upon the frame like emotion and passion. Everyone knows at what time and under what conditions his own muscular control is at the best or at the worst,

and there are very few who do not exhibit some sort of facial or speech disobedience when their time for food is delayed, or there is some worry of business. The imperfect nutrition upon which this condition depends is capable of very certain and obvious relief, and food is a more direct and immediate remedy for it than any medicinal agent.

Of the incidental ills of chorea there is none more striking than its sudden limb and joint pains, acute, fugitive, apt to be worst at night, the wrists being their favourite seat. I believe that local applications are here of slight benefit, and that the best treatment is that which applies to hysterical pains.

As regards medicinal tonics, although of course these are often appropriate in chorea as in other affections, I desire simply to express my belief that they are of no other or higher value to choreic children than to others.[1] A similar statement would not apply altogether to aperient medicine. It is of peculiar importance, as I believe, in this affection to pay particular attention to the character and frequency of the alvine discharge, and to secure, by means of the simplest drugs, a regular action on the part of the bowels.

But there is more to be said about drugs than this. It is impossible to ignore the fact that many competent observers have given testimony in no doubtful terms in favour of certain drug remedies for chorea. Thus, for example, Dr. Begbie states that he has 'never known arsenic fail to cure the malady in an experience of thirty years.' How is it, that with all ordinary sources of error excluded—incompetent knowledge, the mistaking of recovery for cure, the mere habit of boasting and so forth—the very same preparation of arsenic should be uniformly curative in one set of instances and uniformly inert in another? In common with many

[1] I have been misunderstood by Dr. Strange, in his 'Notes of One Hundred Cases of Chorea,' (*British Medical Journal*, July 30, 1881), as well as by others in this matter. It is only of specific remedies for chorea that I am doubtful, and Dr. Strange admits that no such remedy is likely to be found; 'we must ring the changes,' he says, 'upon the so-called nervine tonics.'

physicians I have repeatedly used arsenic with at best but slight effect. Yet not Dr. Begbie alone, but others as little likely to be misled have found it of the highest value. A similar statement would apply to sulphate of zinc, to certain preparations of iron, to conium and other agents. Why, I say, should the very same drug have virtue from the hands of one and no virtue at all from the hands of another? What makes the difference? It cannot be the drugs; it must be the hands. Faith, I am persuaded, makes the great, the real virtue of these medicaments, whether in chorea or other affections allied to it. Arsenic, or anything else, doubtfully or tentatively given with no expression of opinion as to the result, is one thing; and arsenic given with a confident anticipation of cure and much keenness in detecting and proclaiming the earliest signal of benefit is another thing. We have here, in fact, under cover of the drug, the very image of the treatment I am now advocating. And this, which is the only possible conclusion from the facts, is but a modern illustration of what is more grossly shown in the early history of chorea. Only a proportion, it is to be feared, would now be cured by exorcism or visiting the shrine of a saint, yet we know that it was by such methods that the old epidemics were allayed and that the popular sentiment was as potent to cure as to cause choreic disorder. It may be objected that the imagination of childhood is too immature to be affected by such impressions as these. Chorea, however, is not an infantile affection; its chief subjects, children of eight years old and upwards, are the most impressionable of mortals, they reflect at once the temper and the spirit of those around them,[1] and while

[1] Those who suppose children slow to reflect impressions produced upon their elders by causes which the childish mind cannot be supposed to comprehend may profitably read Wesley's *Journal* as to the effect of the revival preaching of his day. 'I heard,' reports an eye witness, 'many cry out, especially children, whose agonies were amazing. One of the eldest, a girl of 10 or 12, was in violent contortions of body. Among other children who felt the arrows of the Almighty, I saw a sturdy boy about 8, who seemed in his agony to struggle with the strength of a grown man. I observed besides one little girl deeply convinced, and a boy nine or ten years old,' &c. &c. See Lecky's *England in the Eighteenth Century*, vol. ii., p. 583, *seq.*

they have enough intelligence to understand what is expected of drug treatment, are sufficiently credulous to believe that the result will accord with the expectation.

But if it be true that drugs confidently administered are of real efficacy in chorea, what becomes of the statement that medicinal treatment is useless. We ought rather to say that the operation of drugs is not of the precise kind that the patient is picturing to himself, and probably as much as this may be said of medication in general. Only, if this hypothesis be the right one, the desired result may be obtained as well by harmless drugs as by those that are harmful. It often happens, as has been said, that the health of the patient will of itself suggest the use of some tonic, and if not, the *aqua camphoræ* of the British Pharmacopœia has been employed with such excellent results that there is the fullest justification for expressing confidence in it.

No other principles than these apply as I believe to that acute form of chorea of which we have examples in Cases 5 and 6 of Appendix A. The vital power of such patients begins to fail early, and it fails very rapidly. The violent and ceaseless movements, the utter want of sleep, the inability sometimes to swallow, sometimes to get food fairly into the mouth, it may be even the very measures designed for relief concur to produce this result. We are face to face with a very grave juncture. Two points especially demand patience, judgment and dexterity. One, the protection of the patient from injury during the violent jactitations, the other the procurement of food and sleep. As regards the first, ample room and scope should be given, not on a narrow bed, but on the floor of a mattress-covered room or perhaps better, for the sake of attendance, on an arrangement of wide beds side by side and foot to foot. Grateful help may be given from time to time by holding the hands or the arms, or by tightening a sheet over the body (as in Case 13), but any continuous or forcible restraint, or coercion of any kind against the expressed wish of the patient, is certainly to be avoided. The movements are always

to be represented to the patients as being in themselves curative, and when this has been sufficiently impressed, as little notice as may be is to be taken of them. There is ample evidence in the foregoing pages of the highly excited and sensitive nervous condition which almost always accompanies these violent motor paroxysms. I am convinced that an array of force, direct opposition, expressions of entreaty or dismay, the presence even of sympathising relatives, are as hurtful here as in hysteria or mania, while on the other hand words of encouragement and a natural demeanour on the part of the attendants are of direct help to the patient. Repeated observation of such result has, indeed, led me to regard chorea like hysteria and catalepsy as the product not of one but of two. The cataleptic or hysteric fit derives an essential part of its material from the presence and sympathy of spectators. It is well known that many nervous phenomena displayed by weak-minded and, in every sense, unfortunate young women, whatever their precise explanation, have to be elicited by means of abdominal pressure applied by the hand of one of the opposite sex. And similarly, although of course not to the same degree, chorea may be stimulated or repressed by the conduct it meets with on the part of the onlookers.[1]

The sudden and serious vital depression which these patients often exhibit must be promptly met by precisely the same means as apply when similar symptoms threaten in enteric fever or pneumonia. Alcohol is sometimes necessary at this stage. But as prevention is better than cure, the great aim should be to administer timely nourishment in sufficient quantity. This business of feeding is often extremely difficult and laborious. Yet it must always be remembered that the ability to swallow, like all the other symptoms, is subject to frequent variation. The nurse

[1] In mentioning so often chorea in its relationship to hysteria, and certain features which are common to both, I must not be understood to imply that the two affections are but different forms of one disease. The radical difference between them at the only period of life when they can by possibility be mistaken the one for the other, is pointed out in some remarks appended to Case 6, Appendix A, p. 161.

must watch her opportunity. I have never known an instance where skill and patience were finally baffled, but I have known them severely tried. The question of nutrient enemata may well have to be entertained.

There is then the question of *sleep*. How long is the patient to be suffered to remain utterly sleepless; by what means may sleep be best procured? At the beginning of such an attack as we are speaking of very little sleep can be expected; the best means towards it consists I believe in successful feeding at frequent intervals with good beef tea, milk, jelly, eggs, &c. The disorder only admits of snatches of troubled sleep. But if two days should pass with no such relief I give from 20 to 30 grains of chloral, with about half the quantity of bromide of potassium (the patient being an adult, as is commonly the case) *at sleeping time.* This failing (and whether it will fail or not is soon seen) a quarter of a grain of morphia may be introduced hypodermically. If even a few hours' sleep should be procured by such means, that must for the while suffice; it would be objectionable in my view to repeat either chloral or morphia at regular intervals. Necessary from time to time as they may be for obtaining sleep, they are never for an instant to be looked upon as curative, or indeed, apart from their special purpose, free from objection.

These acute cases do not long remain in one stay. The real remedy to be confidently and continuously relied on is food and all the conditions of rest. There is, indeed, a question to which no dogmatic answer can be given. Is it lawful to give alcohol with a view to procuring some of its narcotising effect? My own opinion is that where there are signs of typhoid sinking together with insomnia, and other remedies are either not applicable or have been found to fail, then over a short time and for this specific end we are justified in pushing alcohol to this degree, whether the affections be chorea or pneumonia. In the administration both of food and of direct sedatives, it is important to have

regard to the natural habits of the patient ; to give food at the usual meal time, and narcotics at the usual sleeping time.

In such severe cases as we are now considering, the real pinch of the moral treatment is fully felt. It has more than the disease to overcome. In the use of drugs every fatal case is supposed to occur in their despite—every recovering case is due to their agency. In the use of such methods as I am describing every fatal case has been left to perish, and every recovery is spontaneous. Add to this that moral encouragement and support are neither mysterious remedies nor capable of much diversity ; but there is absolutely no end to drugs, and the real feebleness of purpose which appeals to one after the other is easily made to appear fertility of resource.

Chorea, as we have seen, will sometimes prove a very tedious and lingering affection, getting better and worse by turns, suffering, it may be, sudden relapse with acute, transient pains in the joints and limbs, and sometimes, in boys as well as girls, violent hysterical outbreaks. The most suitable treatment for such patients is certainly not that which a general hospital is able to provide. What they want is rest and quiet, and the gentle stimulation of fresh pure air ; they have to endure instead the disturbing and not seldom distressing incidents of ward life, the sight of others affected like themselves, confinement within doors and a hospital atmosphere. On the other hand, I can speak with the confidence of experience, of the service of such treatment as has just been advocated. Examples of chronic chorea sent from the Great Ormond Street Hospital to Cromwell House, Highgate, get rapidly and sometimes almost suddenly well. For the past five years this has been accomplished in almost every instance without the aid of medicine, a result that affords perhaps the strongest evidence that can be adduced not only of the efficacy of the treatment in question, but of the real nature of the disorder.

It hardly needs mention that this system of treatment, like every other, is more or less efficacious according to the subject

acted upon. With children naturally deficient in intelligence, and in those who in the course of the disorder fall into a semi-fatuous condition, moral persuasions and inducements may altogether fail from wanting the material upon which to operate. In some such instances (and Case 14 of Appendix A is a good illustration of the kind), it is necessary to make use of such means to rouse and stimulate the patient to exertion as would be highly injurious at an early stage of the affection. Chorea, no doubt, like hysteria, may fall into a state of self-contentment and apathy which needs to be broken in upon by some method designed to convince the patient that his condition is not a desirable one. This stimulation of the will, however, is only needed in exceptional and chronic cases.

As regards the treatment of convalescence, it has been said already that it is generally a lengthy process. For a considerable time after apparent recovery much care is necessary lest the child should be exposed to any influence similar to that which occasioned the first attack. Too early return to school, the resumption, when still physically weak, of manual labour, even a sudden recalling of all the circumstances of the seizure by being brought back to the same place may revive a chorea which has disappeared for weeks. Choreic subjects, indeed, are always in need of some extra care and help ; and if the disposition which attaches to them with comparatively few exceptions be but recognised in time, we may do far better than curing chorea, we may avoid it altogether.

CHAPTER X.

THE PREVENTION OF CHOREA.

Development and direction of childish movement—Allowance for emotional movement—The therapeutics and morals of movement.

THIS brings me to speak in the last place of the nature and service of that judicious training of children which shall best secure them not only from the assaults of chorea, but from other movement disorders as well, which are far more common, hardly less disfiguring, and more likely to be permanent.

If the movements of the body may be regarded as a reliable index and exponent of the working of the mind, we may make larger use than we do of this relationship in educational training. Viewed from the physical side each period of life has its own defect and need of help. There is a time when the bodily movements are changeful, excessive, and ill-directed; another time when they are tumultuous and spasmodic; and again another time when they become tardy and habitual. Such phenomena, rightly regarded, are plain revelations of mental conditions which appear in no other way. Thus, for example, the character of childish movement is the chief, and for a time, the only indication of the character of childish mind. The necessity for movement is a natural defect of childhood, and observation or attempts at suppressal do not remove, but aggravate it. It is only by ignoring such plain facts that education is made to consist in a strict oversight of children with a view to keeping them still. Such attempts are as hurtful to the bodily as to the mental training. In both apparent success is delusive, and so soon as direct

control is withdrawn some extravagant movement or paroxysm of passion is apt to follow. Children, it is well known, are never really kept still by command and watching, and never, therefore, where this system prevails, escape rebuke, and the further injury to their tender consciences which arises from their believing that they are altogether sinful and that to do well is not in them.

That confidence in movement which is so backward in children needs to be invited by trust and allowance. What is really wanted is not that they should be kept still, which is a task beyond their years, but that they should learn to move with motive, that their limbs should be regarded as instruments awaiting employment and having many uses, simple and complex. They will learn to use, as they will learn to still, first one department of the body and then another in an order which nature herself dictates. Simple and graduated limb exercises, such as may appeal to the sympathy of children by having some fun and variety ; withdrawal of their minds from the mere contemplation of their bodies ; ready praise for muscular dexterity ; freedom from the rigors of church and sermon ; such are amongst the means of childish education which the observation of every healthy child born into the world would seem to teach.

There is no period of life when attention to these points is so imperatively called for as that of childhood, for there is none when mere tricks of movement are so readily caught, or when muscular incontrol stands so nearly related to what is arbitrarily called disease.

And in the further progress of education up to the time of youth and passion, we are never to forget that muscular use is a continual appeal to the mind. The growing flexibility of the voice, the nicer adjustment of the body to even trivial service, the fuller power to co-ordinate and to discriminate accurately between one kind of movement and another, all this implies a discipline addressed to the mind as well as to the limbs, and by these means invading new territories of thought. How much is

lost in mere physical respects by want of such education is well seen in the voice and face and gesture of young men and women of the neglected classes in their converse with each other. No movement of theirs is well-directed or accurately accomplished. Their muscles in wanting variety want power, and from having few uses are the feebler and the more imperfect in such uses as they have. We notice, therefore, although their fancies are nimble enough, how vague and shadowy is the expression of them, how easily they fall into spasm, their uncontrolled and inexpressive features, imperfect power of articulation, and meaningless gestures.

The best testimony to the truth of these principles is to be found in the fact that the parents of the poorer and least educated classes find their children the victims of chorea in large excess over the rest of the community. The treatment of these children in being compelled to painful stillness during school hours, and suffered to run wild during the rest of the day, is in both respects injurious. The natural defect of that time of life gets unfairly put upon at one time and directly encouraged at another. And accordingly, setting aside the instances of chorea brought about by sudden alarm or mental shock, we find young children among the poor quite commonly falling into this disorder from no other cause than that which is furnished by their daily habit of life.

It is to be remembered at the same time that while neglect in the intelligent use of the muscles leaves them disobedient, inexact and unready, a too close attention to their conduct makes them over-sensitive and uneasy. In the case of growing girls, for example, extravagant and inexpressive movement is the precise reflection of newly aroused passions and indistinct mental impressions. Such natural response of the muscles, if left to itself, will work its own remedy, and may claim some little allowance upon consideration of the circumstances. Too often, however, it is aggravated by open notice and rebuke, and thus (as the history

of all nervous weakness testifies) the strongest possible incentive is given to its further development.

We see about us young persons of highly mobile temperament responding with their limbs and faces to joy, and sorrow, and pain, and fear. We observe that the measure of this response grows continually with its exciting cause, and that, after a while, movement becomes involuntary and aimless. We know, both of ourselves and of others, that the power of the will to control the limbs is not absolute but relative. And yet, with all this knowledge, when our children, as yet imperfectly trained in movement, under whatever pressure of excitement, lose sight for a while of order and method in moving, we begin at once to call names and to speak of some material change in the brain or spinal cord; as though want of confidence and distrust, or that insecurity of self-control which is the common inheritance, should have some anatomical equivalent.

The remedy which is needed for these emotional young persons is partly to allow, as with the children, what is in the course of nature, with no surprise and no superfluous attention, and partly to make appeal, not directly to the mind (which in its present mood is little open to such appeals), but to the muscles. Ordered and intelligent movement under the form of some game or exercise requiring judgment as well as dexterity, will occupy the limbs and through them employ the mind. In the case of young men these requirements are amply met in many ways; but with girls, where the need is much more pressing, there are but few pastimes which combine a sufficient variety of exercise with reasonable interest.

And here, even more than with the children, the security which arises from confidence is immediately apparent in the movements. Just as the preacher or actor, or public speaker gains fluency and power almost on a sudden so soon as he is assured of popular favour, insomuch that his later performance seems separated from the earlier by a distinct interval, so is it

with the progress of physical training. We find young women made confident and easy in movement when once they have learnt that these graces are attributed to them. On the other hand, the expectation of failure once aroused by one or two experiences of the kind puts new difficulties in the way of success and may soon shut out all prospect of it. It is thus that both success and failure starting from the same level soon create an atmosphere of their own, and each maintains its place in virtue of its surroundings.

Similar principles hold good when the period of youthful emotion and spasm gives place to the pondering and immobility of advancing age. What moves the body moves the mind. To the melancholic and the hypochondriacal, to the vast body of persons who are self-tormentors, it is quite vain to speak of changing the current of the thoughts. It is the sorest part of their malady that these thoughts are beyond control. Yet except with the most hopeless, bodily exercise in some degree or other is always possible. The body may be stirred when it would be altogether impossible to act directly upon the mind. If the reality and intimacy of the union I am insisting on is once taught and believed as a veritable law of nature, everyone not absolutely insane might be induced to make movement of his muscles on behalf of his mind.

Lastly, there is a moral teaching as well as a practical use in the observation of mind and body in their mutual relations. It is to be feared that there is much self-deception as to the character of this connection. We do but conceal ourselves a little and for a little while.[1] If this fact were generally recognised, many small acts of seeming would be abandoned owing to their cer-

[1] If, indeed, we look to that portion of the community which has the least respect for convention we see at once how little it answers its purpose. It is impossible to gain the confidence of a child without real sympathy. On this account made-up people avoid children, and are, indeed, afraid of them. This characteristic of childhood is sometimes quoted as proof of a rare sagacity or instinct. It seems more probable, however, that the actual insight of the child, here as elsewhere, is inferior to our own, and that it is only in candour that he excels.

tainty of failure. So abjectly hopeless are we in this respect that, with all the aid of crowded streets and shop windows, no man ever succeeded in so simple a stratagem as making another believe that he was unconscious of his neighbourhood when passing im without notice. And yet we think, when in direct intercourse with our fellows, to pass off sham regard or sympathy, well knowing of ourselves that we should at once detect such counterfeits. Conventional usages do not really hide the sentiments, but we agree together to pretend that they do.

But the muscles which are so feeble at concealment are ready at help. No discipline addressed to the body with the view to regulate its movements and enforce order fails to convey the same message to the mind. An upright carriage and direct gaze will compel a like bearing within. It is no mere figure of speech that we use in speaking of those who lean to dishonesty or stoop to meanness. Thus physiognomy (which need not be confined to the face, although there, of course, is its chief seat and index), is a more searching science than it would be quite convenient to admit. The union between mind and body, whether harmonious or not, is never dissoluble. And it is properly so intimate that no conflict can be secret or enduring. The voice of suppressed emotion is really expressing it. The tongue of false congratulation or pretended regard actually stammers. The face of hypocrisy is known and has been drawn. There is but one way of cringing or fawning. The utmost that the will can do, and this only for a while, is to rob these attitudes of their due proportions. It is the same with sincerity. Amid all the strife of opinion and speculative belief, directness of purpose bears a physical impress which finds instant and universal recognition. It proclaims its title of nobility unquestioned, however simple the mind or faulty the judgment.

APPENDIX A.

ABSTRACTS OF CASES ILLUSTRATING SOME OF THE ASSOCIATIONS OF CHOREA REFERRED TO IN THE TEXT.

ABSTRACTS OF CASES.

THE following Abstracts of Cases, quoted in the order of their occurrence, are intended to illustrate some of the characteristics of chorea—*e.g.*, its connection with rheumatism and endocarditis ; dependence on emotional causes; cardiac and paralytic symptoms ; limitation to one side of the body ; occurrence in adult life ; together with various methods of treatment. The object has been not to give a full account of a certain number of cases, but to direct attention to particular points of interest in each. The selection having thus been made partly with a view to exhibit remarkable symptoms and anomalous modes of origin of chorea, cannot be taken as a general picture of the disorder such as would be afforded by a like number of examples taken consecutively, as in Appendix B. With the exception of a case borrowed from Dr. Brabazon as a more striking example of its kind than I could myself quote, and of one which is extracted from the post-mortem book of St. George's Hospital, all the patients were under my own care, and all but three at the Westminster Hospital.

CASE I.—*Heart Disturbance arising in a child while under observation in hospital without distinct evidence of Rheumatism, and shortly followed by General Chorea.*

Alfred G., aged 10, was admitted into the Children's Hospital under the care of Dr. Gee, July 18, 1880, with an account of six months' loss of flesh, and cough, pain in left side and loss of appetite for the last fourteen days. Neither his parents nor he had had rheumatism. The heart sounds were natural. Three days after admission he had some tenderness and pain over the right sterno-clavicular articulation. Temperature, however, had not risen over 100°. There was now audible over upper sternum a well-marked (basic) diastolic murmur. In the course of the next week his temperature became normal, and no

fresh symptoms appeared. But now the heart's action was irregular and 'tumbling,' the murmur persisting as before. The boy, appearing well as to his general health, was sent to the Convalescent Hospital at Highgate. There, while under my care, he got toothache. The action of the heart became thumping, and much accelerated. With this, a restless movement came on which soon developed into a general chorea. His parents, seeing him at this time, and alarmed at his appearance, insisted on taking him away, and he was thus unfortunately lost sight of.

CASE II.—*Heart Disturbance following fright, with pain not identified as rheumatic, and very slight and transient Chorea.*

Emma D., aged 10, was admitted May 29, 1878. A month before she had been much alarmed by being bitten in the hand by a dog. Two weeks after she complained of pain in her knees. On admission there was still pain, but neither redness, tenderness, nor swelling of joints. For three days her night temperature was raised, and there was slight choreic movement of arms and hands. A soft systolic apex bruit was audible. As the pyrexia disappeared this soft bruit developed into a loud blowing mitral murmur.

[These two cases are samples of many where the heart symptoms preceding the development of chorea are connected with local pains and slight pyrexia, both of short duration, but giving some colour to the belief that both cardiac murmur and chorea are of rheumatic origin.]

CASE III.—*Chorea following Acute Rheumatism and Endocarditis, and without obvious nervous cause.*

George H., 13, a shop boy, pale, slightly built, and tall for his age, was admitted into Westminster Hospital, October 20, 1880, with marked chorea of hands, mouth, eyes and tongue, the head and legs being less affected. There was but little muscular inco-ordination. Pulse was 90, temperature normal. The heart's impulse was visible over a large area in normal position ; there was a thrill perceptible of varying distinctness, and a blowing systolic apex murmur which was conducted to axilla and left vertebral groove. Pulmonary second sound accentuated.

This boy was stated to have been strong and well till about a month before admission, when he had acute rheumatism affecting most of the joints. He was laid up for twelve days and attended by Mr. Lattey

of Kensington; he had præcordial pain together with the physical signs of endocarditis. Recovering as was believed from this attack, he went back to his business at Richmond. Three days later he was again attacked with joint pain, this time attended with choreic movement. There had been no previous rheumatism and none of his family had had rheumatism. No mental cause of any kind could be made out. The boy throughout was cheerful and composed. There was nothing of significance in his history except that his paternal grandfather had died insane.

The boy was kept in bed, but no active medicinal treatment was adopted. In less than a week he had recovered fair use of legs. His full recovery was somewhat retarded by a painful whitlow, but within three weeks of his first admission he was almost steady. He was remarkably cheerful and unemotional.

[In an instance such as this, where the rheumatism and the endocarditis are unquestioned, and where there is no room for supposing any nervous upset, it is hardly to be doubted that there is some real connection between the acute disease (whether rheumatism or endocarditis) and the subsequent chorea. This boy affords an example (more strikingly exhibited in Case 8) of chorea following acute rheumatism, not immediately but where the patient too early in his convalescence is sent back to his ordinary work.]

Case IV.—*Chorea with Hemiplegia.*

Caroline C., a domestic servant, 21 years of age, was admitted into hospital in a condition of grave prostration, with a temperature of 102°, a drying tongue, and an extensive but superficial sore over the sacrum. When put to bed it was observed that the face was in violent and continual movement, the tongue likewise being very unsteady and protruded with difficulty. The patient was confused in mind and unable to give any connected account of herself. She answered questions, however, more or less pertinently, but with great difficulty of utterance of the choreic kind. She moaned and cried out so as to disturb the ward, and her arms were restlessly thrown about. There was extreme tenderness above the elbows, the girl crying out upon slight touch. The urine was of high specific gravity (1030), and contained at first a trace of albumen. Large bronchial râles were heard over the chest; the heart-sounds very feeble and indistinctly heard.

The account of the patient, derived chiefly from her mother, was

shortly this : that in childhood she had twice had chorea, severely affecting both face and limbs, and that in December last, while in service, she was laid up with rheumatism, apparently acute. Getting better of this, in about a month she was sent home. After six weeks' holiday she returned to her place and had now to carry a sick mistress daily up and down stairs, a service which she felt to be beyond her strength. She now began to suffer leg pains, and complained of weakness of the knees. A month before her admission she travelled with her employers from Brighton to London. After this journey, and while sitting at tea, she suddenly lost all power in the legs, and was carried to bed. The history at this period becomes obscure, the patient having little recollection of the time. It appeared, however, from the account of the woman who had attended her, that she had complained of pains in the limbs, with cough and restlessness, and had shown much agitation of the muscles of the face.

The further progress of the patient need only be noted in so far as it concerns the relationship between the chorea and the paralysis. After two days' residence (during which, although not actively delirious, the patient was continually crying out, answering away from the purpose, and passing motions in bed, the bowels at the time being very loose) the extreme restlessness of the face became less. There now suddenly occurred a paralysis of the left orbicularis palpebrarum, and with this a complete lax paralysis of the right arm. There was no alteration in sensation, the early tenderness of the arms having disappeared. The tongue was still choreic, the pupils equal and active. Temperature 102·8° ; pulse 102. The aspect and posture of the patient still indicated great bodily weakness. The bronchial signs remained ; respiration between 35 and 40. The heart-sounds becoming more audible, a loud whirring systolic murmur was heard at the base, having certain peculiarities as to place which need not here be dwelt on.

After a week of this condition, during which diarrhœa continued at intervals, no control was exercised over bladder or rectum, and, with an improved mental condition, the prostration was so extreme that brandy had to be given, the patient began to mend. The arm slowly recovered power, remaining for some time obviously weaker than the other. The orbicular paralysis also disappeared by degrees. The face and tongue, as has been mentioned, began to get steady when the palsy appeared, but it is to be observed of the tongue that it suffered a distinct relapse lasting but a few hours. On the tenth day after admission all signs of paralysis had disappeared, and the patient's natural

manner, which was quiet and unexcitable, had returned. She was still very weak, with temperature over 100°, and pulse 120. The bronchitis still continued, and there were some special physical signs at the left apex indicative of commencing phthisis. With the final disappearance, however, of the nervous symptoms, and the progress of recovery so far that the girl was able to get up during a part of the day, the case comes to an end for the purpose for which it is related.

[For full remarks on this case I must refer to a clinical lecture reported in the 'Lancet,' September 6, 1879, from which the following short extracts are taken.

Observe first, that *the chorea anticipates the paralysis*. By how long a time it precedes it is not quite clear. Having already had chorea twice, it is not remarkable that, with the incentive of overwork, and in convalescence from acute rheumatism, the same affection should return. It need not be denied that both the chorea and the arm paralysis which shortly followed it point to one and the same cerebral lesion. Nevertheless, the order of events must be kept in view, and it is this: facial chorea gives the first warning of cerebral change, incoherence of mind, pyrexia, and general prostration announce its actual advent; presently arm paralysis appears, which taken together with the valve disease and rheumatic history, contributes something to determine the character of the injury. We must keep the phenomena in that order.

But, further, this *face chorea takes the form of a general and extreme restlessness*, which is noticed first while the patient is still sensible, and not acutely ill; and, having stopped once, it is suddenly revived again for a short time, and then finally ceases. Moreover, there is nothing partial or one-sided about it; it affects the whole face. Of itself, therefore, this symptom would in no way help to determine the precise place of the supposed brain lesion. With paralysis of the right arm arising from embolus or extravasation, we should have expected rather a paralysis, or spasm, of the right lower facial region. We get neither one nor the other, but the gradual subsidence of an already existing facial chorea (the occurrence of which we may well accept in virtue of the patient's early history and extreme susceptibility in this respect), with a paralysis of the *upper* part of the face on the *left* side.

Let it be assumed that we have in this instance some anatomical change in the corpus striatum or in the neighbouring convolutions which are in fact 'the same centre raised to a higher power representing the same muscles in more intricate combinations;' let it be embolism of minute vessels, or thrombosis, or any other pathological

event calculated to produce an immediate trophic change. When did that particular event occur? In what relation does it stand to the chorea? This girl is ill and weak, and feels herself overworked, her legs fail, she has twice already had chorea, and now again the face is found to be restless. Yet she manages to travel in attendance upon her employers a journey of fifty miles. Reaching home she suddenly loses power, her face becomes more restless, and soon she is compelled to keep her bed altogether. When admitted into the hospital she is pyrexic, delirious, and in a state of dangerous prostration, and presently becomes paralysed in the right arm and upper part of the face on the left side. Now, on the supposition of embolism or extravasation, or any like event, it is to these later symptoms and to this period that such event must be referred, and not to the chorea which preceded them all. The facial chorea, which was a revival of former choreas (happening under circumstances well calculated so to revive it), was obviously anterior, not indeed to a cerebral change of some kind or other, but certainly to that period when such change had issued in any lesion like those we are here contemplating. And not only is the chorea anterior to the condition which is said to produce it, it fails to correspond with it in regard to its seat; for this is not limited to a particular group of muscles but distributed over the face. It is a return of that form of chorea which the girl had already suffered twice, and which any other kind of illness might have revived as well.]

Case V.—*An Example of Chorea, exhibiting rapid transitions and dependence on mental Condition.*

Elizabeth D., aged 12, was admitted on the first occasion for chorea brought on by fright on being threatened with corporal chastisement; the movements, which were not severe, commenced in the left leg and extended to the arm and hand. After a short residence in hospital she was discharged nearly well, but returned after three weeks' worse than at first. This second attack had followed upon a blow. The child walking carelessly had struck her head violently against a lamp post. The movements now concerned the hands, head, and face, there was likewise much restlessness of the tongue and difficulty in speech. She improved considerably after four days in bed, and, now allowed to be up for part of day, could move about with ease and comfort.

Two days later, a week after admission, and a few hours after she

had been much disturbed by the news of the serious illness of her father, she complained of pain in the right arm, wept, refused her food, and occasionally vomited. All the movements were now much increased; the face and right side being the most agitated, and speech very difficult. Night temperature was 100°, the pulse not frequent. Her position, lying low down in the bed, with restless working of the mouth and eyeballs, frequent upward jerking of the chin or flexure of a leg, while the arms, less actively disturbed, lay loosely by her side, or with the knuckles of the flexed hand resting on the chest, indicated at a glance a severe degree of chorea. In attempting to clasp her hands together she would make movements quite distant from her purpose, but once or twice, as by a sudden jerk, succeeded in bringing the palms accurately together. The same sort of intermittent co-ordination was observable in other movements. She was unable to maintain a grasp, and much arm-agitation was occasioned by attempts to take food. Here, indeed, was the main difficulty. It was only after much patience and many trials that food could be swallowed, attempts at deglutition being often followed by general spasm. She was acutely sensitive, readily shed tears when noticed by strangers, and had the usual emotional exhibitions of crying and laughing common in hysterical women. These symptoms continued for three days, at the end of which time, owing probably to the inadequate amount of food taken no less than to the muscular exertion, she was much weakened, and ominous signs of sinking began to threaten. Brandy was now given, and by a sudden spasmodic effort, similar to that which impressed all her movements, she succeeded in swallowing a few gulps of it. Upon this she slept more soundly than she had done for some time, and was still sleeping when suddenly awakened by a street band. Thereupon the muscular agitation returned with almost maniacal vigour. The girl screaming and crying, but unable to utter words. This fit spent itself in about an hour, and the patient, much exhausted, again slept. From this the improvement was rapid and continuous, and the difficulty in swallowing almost disappeared, yet she was still quite unable to perform the movements of walking. The walking power was almost suddenly regained; on February 10, a month from time of admission, she was convalescent.

[This case speaks for itself, in its rapid transitions, emotional admixture, variable power of co-ordination, early appearance of alarming prostration, difficult management and response to treatment. In some of these respects it may be compared with the one to follow.

I need only append the following note by the sister of Harpur Ward, who most carefully and judiciously directed the nursing of the child :—'All through her illness the girl has been fearfully sensitive. We had to be most careful how we talked in her hearing. A misunderstood word would bring on difficulty of speech.']

Case VI.—*Violent Chorea in an Adult, rapidly recovering.*

Marian R., aged 20, a fair-haired, healthy girl, living at home in training to become a governess, was admitted into the Westminster Hospital under my care, June 22, with severe chorea. She had had three previous attacks—the first, occurring at 13 when studying with the view to teaching, was due immediately to fright caused by a boy throwing a dead kitten in her face. She immediately began to twitch the facial muscles, and became 'excitable' and 'nervous.' Five or six months before this she had complained of what were called 'growing pains,' wherein her legs and joints were affected but not red or swollen. The second and third attacks occurred near together two years after the first, and when she was 15. They were both of mild character, and little could be remembered of them. The girl had been healthy in childhood, but apt to walk in her sleep. The family history was of a negative kind, and especially wanting in any particulars of rheumatism or nervous disease.

At the end of March of the present year (1880) the patient was in bed for a week for supposed rheumatism. Some fortnight later, when still feeling the effects of this illness, she was much alarmed by having to spend a night in the same house with a woman who was subject to fits of insanity, and who associated the patient with her delusions. From that time up to her admission the girl felt 'as if going mad,' had visions of rats and mice, was always worse towards night, and feared to sleep alone. She would occasionally ramble in her talk, and foretold that she would presently have St. Vitus's dance. The actual attack commenced thirteen days before admission, and had been getting worse daily.

On admission the patient was found to be the subject of violent chorea affecting chiefly the face, speech, and upper part of the body. A loud systolic bruit was audible at the heart's apex. On being put to bed the movements became much aggravated, and towards evening were so energetic that she was kept in bed with difficulty. Mr. Davies, house physician, gave her two doses of bromide of potassium

with chloral during the night, but she got barely two hours of disturbed sleep. On the following day (June 23), at the time of the usual visit the jactitations were extreme, so as to require constant watching and holding. She spoke indistinctly, and was fed with difficulty. The pulse was now 108 and intermittent, tongue natural. Hearing and sensitiveness were acute. As evidence of this, she was especially disturbed by overhearing a whisper to the effect that her father was not to see her. At times she had some delusions in reference to those about her, but these had always a basis of reality, and she was easily recalled to herself. She reached her worst on the night of this second day, and remained in the same critical condition till the afternoon of the third day (the 24th), when it was thought necessary to place her in an isolated ward.

It is not easy to convey in words the exact violence of choreic agitation. It must suffice to say that from the evening of the 22nd to the morning of the 25th, this girl required the active service of one or more nurses to keep her in bed and prevent her doing herself injury. The jactitation of arms and body was more than of the legs. There was no emotional excitement at this time, but much anxiety and apprehension. When almost at the worst, and desiring to see her mother, she was able so far to control her hand for a moment as to write a few legible words. It was observed also that whenever the violence of movement somewhat relaxed, she would snatch the opportunity to employ her hands to some purpose of the moment. She could also offer her hand to be held accurately and without divergence, and was partially steadied for a while by such means. Throughout, so far as observation was made, she retained such imperfect power of control as enabled her to moderate her movements for a moment when so bidden, but their violence was heightened by such efforts. The pulse was now 120, the temperature could not be taken at the full strength of the paroxysms, but immediately before (on the 23rd) it was 99°.

So soon as the case had actually assumed the degree of violence that it threatened from the first, it was resolved to attempt no specific or experimental treatment, but to direct attention to removing all removable discomfort; to supplying food; and to the procuring during night time of a sufficient amount of sleep by the help, if necessary, of such narcotic as might prove the best. With this threefold object several mattresses, bounded by pillows and bolsters, were placed on the floor of the room to which she had been removed in such manner as to form a capacious bed ample enough for the patient to lie at

length in any direction and to fling her limbs about without injury. She had already had repeated doses of morphia subcutaneously without effect, and on the morning of the third day (the 24th), some hours before her removal to the separate ward, had been given thirty grains of chloral. She got, however, only short snatches of sleep, was fed with extreme difficulty owing, not to any impairment of deglutition, but to the violence of movement, and her strength was beginning to fail. It was now decided to suspend all medicine whatever during the day, but that, if absolutely sleepless during the night, a hypodermic injection of a quarter of a grain of morphia should be given. Three ounces of brandy were ordered in addition to such liquid food as she could be got to swallow. She was left almost free and unrestrained as regards movement, with the assurance that she might throw herself about without fear of injury and that such agitation was not in itself evil but rather to be suffered as working out the cure. This same night, in pursuance of the plan described, she was injected with a quarter of a grain of morphia, but was restless and sleepless, although less violent. On the 25th the agitation had moderated considerably but increased towards evening. That night the sleeping draught consisted of thirty grains of chloral, a dose which (without absolute occasion) was repeated on the night of the 26th.

For in fact the morning of this, the fifth day, saw the end of the chorea in its violent and threatening form. The patient had slept for six hours. She now for the first time exhibited emotional excitement in tears and lamentations, the hands and arms, heretofore violently agitated and still unruly, being now employed to some extent in giving expression to these feelings. This hysterical state lasted only for the day. The girl was brought back to the general ward with but slight chorea affecting chiefly the hands. It was now for the first time possible to judge of the patient's aspect and bearing. She appeared to be an intelligent girl, cheerful and contented. During convalescence she had for two days pain with some tenderness in the left wrist and back of the hand. On the 27th, the sixth day from admission, she was up and about, some choreic restlessness being still perceptible, but to such slight degree as to make it unnecessary to keep her much longer an in-patient. The cardiac murmur still continued, although much softer and less distinct than at first.

[The points for consideration in the case concern its distinctive characters; method of progress and recovery; and response to treatment.

Here was obviously a chorea due to mental disturbance in a predisposed person and with the interval so often observed between the exciting cause and the actual outbreak of muscular disorder. At such an age, as I have said, chorea is in many respects quite different from the chorea of childhood ; it is more severe ; it is almost always mixed with some mental disturbance and it occasionally ends fatally. The violence of muscular movement observed in this particular instance could hardly have been exceeded. Yet it exhibited, as in my belief it does always, an element of voluntariness. The girl could remain comparatively still for a second or two when so bidden, an increased violence of movement following such effort. We are to observe, however, how differently exercised is this volition from that which is seen in hysteria. In the short intervals of partial quiet this girl would seize the opportunity to perform a muscular act which she had strongly in mind (*e.g.*, writing a few words to her mother), making such use of her fingers as was possible between her paroxysms. The hysteric, on the contrary, occupies the same periods in relaxation and self-regard. She shows no similar anxiety to get work out of her muscles in their lucid intervals. There is further a strong contrast between the distress which the choreic shows at the sight of her disorder and the mental concurrence which attends the hysteric convulsion. Thus, whatever the alliance between the two affections, the difference between them is obvious. The muscles are in conflict with the will in the one case and in some sort of agreement with it in the other.

It is to be observed further how, in its utmost severity, the disorder of chorea keeps itself clear of spasm. At no time could it be said in the present instance that any particular limb or set of muscles was in true convulsion. Looking at these patients on the whole, as common observers do, the amount of their disorder seems hardly to be surpassed, but looking at one limb only or one set of muscles, its movement is seen to be neither convulsive, nor repeating, nor even continuous. The arm, for instance, is flung about now in this direction and now in that, with a half-recklessness which is always under some sort of command, and which is considerably modified for the short time that attention can be centred on that particular part. Anyone who will hold the hands of a violent choreic for a short time will recognise this diversity of movement. This same absence of spasm is seen further in the grimacing of the face, while the measure of volition is shown in the rarity with which the tongue gets severely bitten or the fæces discharged, as happens so commonly in epilepsy.

It has been observed of these patients, as happened in the present case, that the chorea increases in violence on the patient's first admission to hospital. There is much in the nature of the disorder to make it probable that removal from home with the restraints of hospital and observation of strangers may be in part responsible for such result. Chorea, I believe, at its beginning and in its common form is best treated by rest at home, a quiet and even life and no open notice. But it is with chorea beyond this stage that we are now to deal. And in a case like the present, when, together with mental exaltation, the jactitations are of such strength as to need the most watchful coercion, one cannot but reflect upon the moral and physical effect of such restraint. The mode in which chorea culminates is not so very different now and in the old time. With less of gross and naked superstition the subjects and the provocatives of the disorder remain the same. And so probably do the remedies. With no actual belief in demoniacal possession there is still present to the minds of these patients a mysterious and unseen agency which takes the place of the will, and which, it is often feared, will presently disorder the reason. The distress and demoralisation which chorea commonly excites in its adult subjects are well worthy of attention. There is the widest difference between them and young children who, having no deliberate will and but little experience of muscular conduct, are ready to concur in any kind of movement. These elder patients, as in the present instance, often believe they are going mad; their friends often ask whether the complaint will 'not go to the brain.' In such circumstances, as mentioned in the text, it is no small thing to give the body the amplest opportunity of movement without fear of injury, and to give the mind the best support that can be devised by representing the movements as having a curative design. In extreme chorea this can only be accomplished by the method that was here followed, room for movement and no discouragement to moving; abolishing the pain of physical restraint and allaying in great measure the apprehension and even terror which the movements themselves excite. And the marked change which ensued upon these measures was very striking. The violence of movement left unchecked soon spent itself, just as a high sea gradually dwindles on a shelving shore, but rises into greater commotion when some direct obstacle opposes it.

While the course of the chorea in the present instance was marked throughout, as it so often is with adults, by great sensitiveness and anxiety, it was only when the muscular disorder began to decline tha

the hysterical symptoms appeared. We see precisely the same sequence in hysteria itself. During the height of hysterical spasm emotion is in abeyance, the convulsion ceases and the patient breaks into tears or laughter. Thus, notwithstanding the very real distinction between these disorders which has been already mentioned—the distinction, namely, that the choreic woman is dismayed and distressed at what has come upon her, while the hysteric surrenders herself willingly to a spasm which is in itself a relief—there is an obvious alliance between the two. Choreic patients are mostly hysterical. Chorea will invite hysteria. The chorea of childhood may become the hysteria of womanhood. It may even be difficult to decide whether to call a restless movement by one name or the other.

A word as to drug treatment. Drugs were pretty freely used at the first and were wholly inefficacious; the improvement set in when they were stopped and when bodily freedom and moral support were substituted. I do not propose to draw large conclusions from a single case, but I ask whether, supposing this favourable change (which was both earlier and greater than is customary in chorea) had coincided, not with the suspension of drugs, but with the change from one drug to another, we should not have heard a great deal of the virtue of drug-treatment and been charged with unreasonable scepticism for expressing any doubts upon the subject?

Case VII.—*The Chorea of Imitation and Sympathy.*

The following case is related by Dr. Brabazon, physician to the Bath Mineral Water Hospital, in a paper upon the treatment of chorea with the Bath mineral waters, published in the 'British Medical Journal,' May 15, 1880:—

'The patient, a girl aged 18, was admitted to hospital for chronic rheumatism and amenorrhœa. She was a stout healthy-looking girl. Her home was in the quiet village of Wrington, in Somersetshire, her mode of life and general surroundings were most unsensational. There happened to be in the same ward with this girl a child suffering from chorea, but not of an exaggerated type. After being in hospital about a month this girl was suddenly seized with chorea in its most severe form. In attempting to walk, she knocked herself black and blue against furniture or whatever came in her way; she could not hold a cup in her hands, or feed herself, and, at night, was sometimes jerked as it were out of bed. Her facial contortions and grimaces were

horrible to behold. No votary of St. John, no disciple of St. Vitus, no victim of tarantism could have proved a more perfect specimen of "Chorea Sancti Viti" of the middle ages. It became necessary to isolate this girl completely from her fellows, some of whom, in accordance with the history of the disease, would in all probability have been similarly affected, and the Mineral Water Hospital would have been assimilated to an asylum for "jumpers" or "shakers." This patient was placed in a room by herself, with one attendant, the room being so padded and arranged that she could not injure herself. Mr. Coppinger, the Resident Physician, has favoured me with notes of the case. I should mention that in this, as in all the cases which I have seen, the thoracic movements were bilateral. The medical treatment employed was bromide of potassium and chloral hydrate in full doses at night. When the symptoms were most violent, six leeches were applied to the inside of the thighs; and, after a time, when the acute symptoms had subsided, she had tincture of belladonna, perchloride of iron, and a reclining bath daily at 100° Fahr. This was palpably a case of acute chorea, induced by morbid sympathy, in a female at the age of greatest nervous susceptibility, and under circumstances of functional derangement adapted to aggravate the symptoms. I think there could be no better example than this of a case of acute chorea, and no case better suited to form a link in the chain of connection between the epidemics of the middle ages and the sporadic cases of the present. It also bears out to some extent the theory of Dr. Sturges as regards this and other analogous diseases, regarded by him as simply an affection of function.'

CASE VIII.—*Chorea after Convalescence from Rheumatism with emotional admixture, delusions, &c. Relapse. Muscular Paresis occurring together with mitral murmur.*

William L., a healthy-looking youth, aged 16, a railway porter, admitted April 7, 1881. After an attack described as acute rheumatism (and for which he kept bed two days, and remained at home by the fire for fourteeen days longer), this youth, on convalescing, was put to new and harder employment as a railway porter. He kept at this, although feeling overdone, until a fortnight before his admission, the joint pains not wholly leaving him. He then, while still at work, had an hysteric fit, crying and kicking, on recovery from which

both hands were found to be choreic. Next day the legs were affected, then the head, and in a week's time the speech was difficult. The pains increased as the chorea appeared.

On admission there was choreic movement of both hands, and some dragging of the left leg. The hands worked awkwardly, and their grasp was insecure, the right hand being the worst. There was much speech difficulty, and the face was vacant, partly no doubt from muscular fault, although besides the youth was wanting in intelligence. The heart sounds were at this time normal.

After about three weeks' residence, getting about, feeding himself with difficulty, this boy had a severe attack of general chorea with frequent shrieking and temporary delusions ; as that his brother had met with an accident on the railway. With this attack the wrists became painful and tender, and, on the partial subsidence of the pain, the right wrist dropped, insomuch that for a while the hand could hardly be raised into line with the arm, the grasp was likewise very feeble. Along with this a systolic murmur appeared most audible at the base or over the right auricular region. In two days and quite suddenly the wrist power returned, and the cardiac murmur disappeared.

The boy remained in hospital for some time longer, able to get about, and in good general health, but still unsteady, especially when the hands were employed. He was ultimately made an out-patient.

[This case illustrates the occasional alternation of joint pains (in this instance probably rheumatic), with chorea ; also the occurrence of a distinct paresis of certain muscles along with an equally distinct cardiac murmur, both symptoms being temporary (See Chapter III. p. 69). The exciting cause of chorea in this instance was a not uncommon one, the overstrain of harder work than the youth was accustomed to when imperfectly recovered from rheumatism. The hysteric fits and mental aberration are also noteworthy.]

CASE IX.—*Choreic Movement of the Hand following Partial Paralysis of the Arm after heavy lifting. Chorea changing side.*

George C., aged 14, a healthy boy, kitchen-help at an hotel, admitted April 15, 1881, stated that four weeks before he had lost power in the right arm after carrying heavy trays. A week after this loss of power, and first brought to his notice from his letting a cup fall, the boy got choreic movement in the right arm and hand. He

had had no rheumatism or previous illness. Heart was natural. During time of his residence this boy got passing attack of pyrexia, in which he exhibited general restlessness, which for a few days threatened to pass into severe chorea. It was short-lived, however, and on its subsidence left him unsteady in the affected arm as well as in the face. He was made out-patient when still imperfectly recovered.

This youth was admitted a second time, with chorea now most on *left* side.

[This case shows the association of chorea with that functional paralysis which arises from fatigue of certain muscles, the subject, as the subsequent history showed, having a predisposition to chorea. The seat of the chorea on the second admission affords one of the many exceptions to the rule that subsequent attacks of the disorder are repetitions of the first.]

CASE X.—*A Moderate and Partial Chorea of Left Side following rheumatism converted, upon the occurrence of fright (more than three months after the rheumatism) into Violent General Chorea, in which the right side was most affected. Succeeding joint affection.*

Louisa P., aged 10, a delicate-looking lean child, had had rheumatism five months before admission, followed (after a clear interval of three weeks) by twitching movements of the left arm and leg. This disorder continued up to a week before admission (*i.e.* for about three months), the child getting about as usual. She was now greatly alarmed by being beaten by some boys in the street. The movements thereupon became general and violent, and worst on the right side. Chorea was still severe on admission, insomuch that for the first three weeks she had to keep her bed. She made good gradual recovery, and was fairly steady in about five weeks.

When on the way to recovery this child happened to fall on her right elbow. The joint next day became swollen, red, and tender, and was put up in splint in flexed position. The swelling and redness shortly subsided; the elbow joint, however, remaining stiff and the arm constantly maintaining a position of rigid flexure, the patient was referred to Mr. Macnamara. It was found that under chloroform the joint movements were normal, as they appeared to be also in sleep. Mr. Macnamara was of opinion that the elbow-joint was perfectly

healthy. The rigidity, nevertheless, persisted. Considerable force, met by continuous and unvarying resistance, served to flex the fore arm partially; the girl giving utterance to pain the while, but without any hysterical manifestation. By the time these symptoms had developed, the chorea had disappeared, and the child's general health was good. Not only could the arm be easily flexed during sleep, but the condition improved so rapidly upon the promise to the child that she should go home when the joint was well that, although the extreme resistance to flexure and other signs were anomalous, the symptoms generally coincided best with so-called hysteric joint.

[The case is introduced to show how a slight localised chorea may be aggravated to severe and general chorea by nervous shock. It shows also, like the last, that chorea in its second attack may change its side. Further, the joint affection which arose in the course of convalescence is a good illustration of the sort of symptoms which cause chorea to pass as rheumatic upon very dubious grounds.]

CASE XI. — *Left Hemichorea implicating lower part of left face, left hand, and left foot in a young pregnant woman newly married, a month after rheumatic attack.*

Jane C., aged 21, ironer, four months married, and in third month of pregnancy. Two and a half months before admission she had had pains, swelling and tenderness in the small joints of both hands and the left foot, for which she kept bed a week. Five weeks before admission (*i.e.* something over a month from supposed rheumatism and when in good health) suddenly, and from no apparent cause, she felt a twitching or turning outwards of the left hand, the left foot soon participated, and the left corner of the mouth had downward twitch. These movements were very perceptible on admission, although not violent. The woman had never had chorea, and, except for headache and neuralgia, knew of no previous illness. There was no rheumatism or neurosis in her family history. A variable systolic bruit was audible between apex and base of the heart, sometimes loud, sometimes quite lost. The patient improved in a few days, and left the hospital after a fortnight's residence, nearly steady.

[Here was a strictly one-sided affection, involving both face and hand, and foot, in just such manner as irritation of a motor centre would, and without the slightest participation of the right side. If hemichorea at all, then a very perfect and complete hemichorea,

pointing to a definite seat of irritation. Yet it was not a continuous restless movement, but an occasional twitching, without muscular inco-ordination. If the term chorea is to be restricted to the characteristic form of the child's affection, this case would not be an example of it. Yet in its occurrence during pregnancy, partial control by the will, the state of the heart, and the complete recovery, its near alliance to chorea is obvious; while the exception which it offers in its mode of distribution over the body to the common rule of that affection is very significant.]

Case XII.—*Chorea in Middle Life occasioned by mental shock.*

James S., aged 38, a wire-worker, intelligent and unemotional, with no history of chorea, syphilis, or rheumatism, either personal or in his family. He had enjoyed good health up to three years ago, when he lost a child by death. He then became unsteady in the left arm, and soon in left leg and left side of face. Eighteen months ago, on the death of his wife, the chorea became general. He was for two months in St. Thomas's Hospital, and afterwards at Guy's. In the latter hospital he had an attack of acute illness described as rheumatism, and lasting two months. On recovery the limb movements became somewhat less.

The patient is in good general health, and least unsteady when employing his hands holding a book or turning over leaves. He is even able for a while to work at his trade. The choreic affection occupies the limbs, face, and speech muscles. In the limbs it is seen most in movements of extension, giving to his gait as he walks a curious spring for each step. The heart's action is regular except that with some beats there is marked prolongation of the first sound. When lying in bed the movements are almost confined to the upper limbs. The pulse is 94, temperature habitually subnormal, a little over 97°, rarely reaching 98°.

The patient remained in hospital for about two months, and improved unquestionably in his command of speech and power of walking. His own estimate, however, as to the measure of his recovery exceeded that of other observers. His poverty and precarious mode of living previous to admission made him so far a favourable subject for treatment, and such progress as he made towards recovery was due no doubt to improved nutrition from better living. As already mentioned, he was always best when his hands

were employed, and when discharged he believed himself well enough to resume his employment.

[This case affords an example of the very rare occurrence of chorea to a man of middle life, and not excitable or notably feeble in intellect, from the operations of causes similar to those which produce the disease in childhood. It is the more remarkable as he had not suffered chorea in early life. As regards rheumatism, the patient was certainly without it until after the chorea had become confirmed and general. The exact nature of the attack in Guy's Hospital described as rheumatism could not be made out owing to the man's infirmity of speech. For the same reason this case cannot be quoted to negative the statement that no grown man of full mental capacity ever yet suffered chorea. The degree of intelligence through all the difficulties in the way of expression could not here be estimated, and there was no evidence as to his condition in this respect when first attacked. He was not conspicuously emotional, was fairly educated, and fond of reading.]

CASE XIII. — *Severe Chorea with Muscular Paresis ; variable ataxy ; extreme agitation of the hand ; benefit to be derived from mechanical support and muscular exercise.*

Annie M., aged 12, an intelligent and tractable child, lean but of healthy aspect, was brought to hospital with rather severe chorea of about three weeks' duration. The affection was first noticed from her dropping her glass while drinking. The over-movement was now general, but affected the right side chiefly. Both hands were very unsteady, and the right could not be fairly extended from the wrist, but habitually drooped more or less. She was quite unable to stand, or walk, or move the legs in any desired direction. The girl had never had rheumatism, and the attack (which was the first) was attributed to falling downstairs or, perhaps, to toothache and extraction. There was neither chorea nor rheumatism in the family history. The heart was slightly uneven in action and the first sound prolonged.

The choreic movement soon became much worse, so as to require special watching. With the full consent and concurrence of the child means were employed mechanically to restrain the limbs. A sheet wide enough to cover the whole trunk was stretched over her and tied round the bed. This was applied and removed at her pleasure,

and by its aid she got sleep and soon improved in steadiness. But now with the lessening of the more active agitation a general muscular weakness became apparent. The girl lay low in bed, and the inability to stand was now due rather to want of strength than want of steadiness. The rhythm of the heart had become irregular. There was no appreciable wasting. It now became a nice question whether her condition might be best met by rest in bed or by directing such use and exercise of the muscles as was possible. In the belief that the paresis was parallel to that met with in hysteria, and with a view to testing that opinion, the girl was directed to be up for a few hours daily. In the course of a fortnight she was able to walk with some support, dragging the legs somewhat, but showing no misdirection. The face was still unsteady, and, as at the first, words were uttered with difficulty and in jerks ; but the stress of the disorder was now chiefly in the right hand, which was utterly choreic, and unable either to be still or to make any attempt at grasping.

In pursuance of the same plan that had succeeded with the general disorder, this hand was now bandaged down on a straight splint, the child concurring in this as readily and indeed eagerly as in the case of the sheet. For the first week of this treatment the hand could be felt with the fingers wriggling about under their bandage. After this the hand became rapidly steadier. She was able first to hold a penci[1], and soon to write : *the return of writing power being noted to a day and even to an hour*, while once regained (as in the case of walking), it was very soon regained completely. The girl was in hospital altogether about three months, the first fortnight of that time showing a severe degree of chorea, and the rest of it being occupied with recovery which, although slow on the whole, was rapid and almost sudden in its main incidents.

[Besides the points for notice already alluded to in the text of this work, this case may be quoted amongst others to show the benefit of restraint. The mechanical aids to steadiness which were given to this girl, if they did not quicken recovery (and I am not certain that they did), were yet grateful to the patient, and were applied only in so far as they were so. Restraint which is not directed and qualified in this way, restraint which is sternly ordered by the doctor without consulting the patient, is more likely to do harm than good, and sometimes does very serious harm. But with the patient's concurrence, and with a clear understanding that it may be used and disused at will, mechanical restraint may sometimes be made use of, on and off, with

manifest advantage, even in cases more violent than the present. Another point of interest concerns the treatment of the general paresis of chorea and the need of stimulating the muscles to exertion. The rapid transitions of the disorder, and especially the quick recovery of the use of the fingers shown in the present case, are highly characteristic features.]

CASE XIV. — *Chronic Chorea with Incontinence of Urine, emotional attacks and temporary Heart Disturbance. Condition of fatuity succeeding. Improvement with discipline.*

Samuel S., aged 13, a fresh-coloured healthy schoolboy, of blunt intelligence, had pains in the left thigh ten months before admission, shortly followed by choreic movement of the same side. The present is a second attack of three weeks' duration, affecting the left arm and especially the face (the forehead and eyebrows being in constant movement). There is no apparent cause for this second attack. The case, never violent, was extremely obstinate. It was marked by three notable incidents: incontinence of urine; emotional or hysterical attacks; and great variability in the character of the heart's action. The incontinence continued more or less throughout his stay. The emotion was exhibited on the occasion of a sudden death in the ward, when the boy had a fit of crying and sobbing with much increase in the choreic movement. The heart, at first regular and without obvious murmur, became for a while irregular or uneven, and developed a variable murmur which exercise made louder, and was post diastolic in time, and heard best just above and within the apex impulse.

After many variations this boy fell into a half fatuous state, where, as will be seen from the description, it was extremely difficult to estimate the precise mental condition. The muscle movements, moderate but general, were greatly aggravated on moving, and he was quite unable to walk or stand. He lay habitually on the back, low in the bed, constantly grimacing, and passing urine involuntarily. When addressed he would sometimes merely grin, and sometimes make an effort at speech, never getting out more than a word. He took food well, but wasted somewhat. His temperature was habitually subnormal, between 97° and 98°, pulse very variable, ranging from 96 to below 70.

When this boy had been over three months in hospital it occurred

to Dr. Donkin (who then had charge of the ward and to whom is due the full credit of this treatment) to make trial of moral persuasions to exertion more forcible than had hitherto been employed. The patient was with some difficulty got out of bed, and unavailing attempts were made to get him to stand with the help of some support. This failing, a faradic current of some strength was applied, much to the patient's dismay. *The next day he stood*, and from that time made continuous and rapid progress, no further severity of urging being called for. The face unsteadiness in lessened degree persisted, but in other respects the boy was almost well three weeks from the commencement of the active treatment.

[The lesson of this case, so far as treatment is concerned, speaks for itself. Yet, though it yielded rapidly to moral suasion applied at the right time, it was truly a case of chorea as evidenced by the continual movement of the face no less than of the limbs, by the speech difficulty and the condition of the heart. The variability of the pulse and subnormal temperature were further signs which could not be mistaken. What the treatment accomplished was to break the monotony at the time when the affection, no longer active, had left a stupid boy without the vigour to bestir himself unless strongly roused. Such treatment is only to be commended for such cases, yet its success in this instance is one of the many illustrations we have had to consider of the points of contact between chorea and hysteria. It need hardly be added that faradism has no specific effect, and that any other application equally disagreeable would be equally effectual.]

Case XV. — *Chronic Chorea in a boy of eleven, ultimately fatal.*

[The following case was under the care of the late Dr. Fuller at St. George's Hospital, in 1864, and reported by myself, then Medical Registrar, the post-mortem examination being performed by Dr. Dickinson, then Curator of the Museum.]

Leopold L., aged 11, admitted July 13, 1864. The boy had before been an in-patient, and was discharged improved, but on returning home his disorder at once returned. At the time of his second admission it had lasted three months. No cause could be traced. The patient was well nourished, of dark complexion, and not unhealthy aspect. The chorea was general but at the first not extreme. He

was given iron and sulphate of zinc, the latter up to five grains for a dose, and for a short time improved. This early amendment, however, not continuing, he was ordered strychnia with iron, and morning shower baths. At the end of five weeks from his admission his state had become distressing. He got little sleep, had wasted much, the tongue was frequently bitten, and the skin scratched with the finger nails.

The liquor arsenicalis was now given in five minim doses, thrice daily; many other drugs followed, particulars of which it is unnecessary to insert, since none exercised the slightest beneficial effect. The symptoms progressed without interruption, the skin was excoriated, the tongue bitten, and bed-sores began to threaten. At this advanced period of the disease it is noted, 'There seems a strange mixture of temper with the disease, rendering it difficult to discriminate between the two. His most violent paroxysms may be controlled for awhile by speaking sharply to him.' Ten days before his death he was tied down, and, to prevent further injury from his scratching, the hands were secured. So he lay like one possessed, struggling and kicking, the mouth and tongue deeply ulcerated, and the body lacerated and bleeding wherever his fingers could reach it. He died September 17, after over two months' residence, and more than five months' duration of chorea.

Post-Mortem Examination.[1]

The body was much emaciated, and the skin rubbed off the prominences of the back; the hair was worn off the back of the scalp, and under its skin was a collection of pus; the lips were scored with fissures. The *brain*, both grey and white, was injected, the ventricles natural.

The *cord* showed on its surface large vessels distended with blood. On section in various situations, its appearance was not unnatural; but on closer inspection portions of the grey matter seemed duller and more yellow than natural, particularly towards the upper part. External to the membrane were much distended veins lining the vertebral canal. No microscopic examination was made.

The *heart* at the inner edge of the mitral valve showed a line of soft beads of lymph easily detached. The left ventricle was contracted.

[1] This case is referred to in Dr. Dickinson's paper, *Med. Clin. Trans.*, vol. lix., and included among the 22 fatal cases he has collected.

The kidneys were congested. Other organs natural.

[Although incomplete in some respects, I am induced to select this case for quotation in this place, owing to its extreme rarity. Chorea in a chronic form occurring to a boy of this age, and persisting up to the time of death, *no extra symptoms supervening, but the disease maintaining its proper characteristics to the very end*, is, as I think Chapter IV. tends to show, an excessively uncommon event. There was no trace of paralysis, no known rheumatic connection, and no cerebral symptoms beyond those of temper. Compare Case by Dr. Peacock, St. Thomas's Hospital *Reports*, vol. viii. p. 29.]

APPENDIX B.

TABLE A.[1]

132 CONSECUTIVE CASES OF CHOREA, SHOWING ITS RHEUMATIC CONNECTION, STATE OF HEART, EXCITING CAUSES, LIMBS AFFECTED, &c.

[1] In the composition of this table I am indebted to notes furnished me, at the time the patients respectively came under my care, by several successive Registrars of the Hospital for Sick Children, during the five years the work has been proceeding. The present Registrar, Dr. Abercrombie, has supplied the largest portion; Dr. Garlick the next largest.

SUB-SERIES I.

No.	Name	Age	If previous Whooping cough	If Rheumatism previously	If Rheumatism in family
1	Charlotte O.	6	Whooping-cough	Rheumatism	Not entered for First Series.
2	Anne N.	11	,,	o	
3	Henry R.	9	o	o	
4	Albert S.	7	Whooping-cough	o	
5	Fanny P.	10	o	o	
6	Emma R.	6½	Whooping-cough	Swelling of wrists and ankles	
7	Ellen C.	8	,,	No Rheumatism	
8	Amy A.	8	,,	? Rheumatism	
9	Rosa R.	7	o	o	
10	Arthur W.	8	—[1]	o	
11	John W.	7	—	o	
12	Henry P.	7	—	—	
13	Amelia B.	7	—	—	
14	Alfred M.	10	—	o	
15	Florence B.	6	o	o	
16	Louisa S.	9	Whooping-cough	Very doubtful	
17	Susannah M.	7	,,	? Rheumatism	
18	George P.	6	—	o	
19	Agnes D.	8	Whooping-cough	o	
20	Alice H.[2]	11	,,	o	
21	Martha C.	9	,,	o	
22	Jane C.	9	—	—	
23	Sarah C.	9	Whooping-cough	o	
24	Amy D.	5	,,	o	
25	Beatrice P.	6	—	—	
26	Ruth L.	4	—	—	
27	Walter N.	9½	o	o	
28	Herbert B.	7	Whooping-cough	o	
29	Anne O.	10	,,	o	
30	John B.	8	,,	o	
31	Mary H.	8	,,	o	
32	Emma K.	10	,,	o	
33	Anne F.	11	o	o	
34	Alice D.	11	Whooping-cough	o	
35	Mary H.	8	,,	o	
36	Alice M.	10	,,	o	
37	Rose G.	9	,,	o	
38	Florence E.	9	,,	o	
39	Charles B.	9	o	? Subacute	

[1] This mark indicates throughout that the point in question is not referred to in the notes of the case.

[2] Right hand choreic constantly against all control.

SUB-SERIES I.

Heart Condition	2nd or 3rd attack	Part of Body where Commenced	Supposed Cause	Result	Remarks
Mitral regurg.		Twitching face	—	Well	
,,		—	—	,,	
,,		—	—	Rapid Improvement	
—		—	No cause,[1] gradual, father insane	Nearly well	
—		—	No cause, emotional	Well	
—		—	—	,,	
Mitral dist.		Began in right hand	—	,,	
Mitral regurg.	2nd	—	No cause	,,	
—		Began in hands	—	,,	
—		In left hand	—	,,	
Syst. Murmur		In left side (? hand)	No cause	,,	
—		—	Fright	,,	
—		Left side	,,	,,	
Murmur		Right side	No cause	,,	
Mitral Mur.		,,	After measles	,,	
—	2nd	Right side (both attacks)	No cause	,,	
Mitral regurg.		Right side	,,	,,	
—		Right hand	After 'low fever'	,,	
—		Right side	Harsh treatment at school	,,	
Syst. murmur	4th	Right arm ?	Fright, overtaxed at school	,,	
—		—	Fright	,,	
—		Left arm	Fright at school	,,	
—	2nd	,,	Overwork at school	,,	
Irregular		,,	No defined cause	,,	
,,		Genl. twitching	—	,,	
—		Right hand	Fright	,,	
o	2nd	Left leg	1st attack fright	Not improved	
Regular		Left arm & leg	None (nervous)	Well	
,,		Both hands	Death of brother	*In statu quo*	Stupid
,,		Fingers & face	Fright, sunstroke	Well	
,,		Hands	Pinching right hand	,,	
,,	3rd	Left hand & side	None	,,	
,,		Left side	,,	—	
,,		Right hand	Fright	Well	
,,	2nd	—	—	Improved	See 31
Murmur		—	? A fall	Well	
Regular		Right hand and leg	Very studious, ? cause	,,	
—		Left hand	Worms	,,	Nervous
Regular, murmur variable		Hands	No cause	,,	

[1] 'No cause' denotes none ascertained after full enquiry.

SUB-SERIES I—*continued.*

No.	Name	Age	If previous Whooping-cough	If previous Rheumatism	If Rheumatism in Family
40	John B.	4	Whooping-cough	0	Not entered for First Series.
41	Gertrude W.	9½	,,	0	
42	Emma S.	8	,,	0	
43	Jane S.	7	,,	0	
44	Fanny F.	11	,,	0	
45	Louisa A.	12	,,	0	
46	Mary F.	9	0	0	
47	Maria N.	10½	Whooping-cough	*Rheumatic fever*	
48	John B.	9	,,	0	
49	Frederick M.	10	,,	0	
50	Katharine S.	6	,,	0	
51	Louisa J.	12	,,	0	
52	Emma R.	11	,,	0	

SUB-SERIES II.

No.	Name	Age	If previous Whooping cough	If previous Rheumatism	If Rheumatism in Family
1	Marion B.	5	Whooping-cough	0	—
2	Henry M.	9	,,	0	—
3	Jane C.	10	0	0	—
4	Eleanor B.	5	Whooping-cough	?	—
5 [1]	Florence E.	9	,,	0	—
6	Charlotte G.	10	,,	0	—
7	Elizabeth L.	8	,,	0	—
8	Amelia G.	11	,,	0	Father rh.
9	Hannah C.	11	,,	0	0
10	Richard G.	11	,,	0	0
11	Alice W.	6	,,	0	Father rh.
12	Eliza L.	8	,,	0	0
13	Katharine S.	10	,,	0	0
14	Ernest James T.	8½	,,	0	0
15	Christina A.	10	—	0	—
16	Elizabeth F.	8	0	Rheumatism	0
17	Elizabeth P.	10	0	0	0
18	Henry M.	8	Whooping-cough	0	0

[1] Habitual flexure of right wrist developed; said to have been palsied on that side; no distinct account.

SUB-SERIES I—*continued.*

Heart Condition	2nd or 3rd attack	Part of Body where Commenced	Supposed Cause	Result	Remarks
Regular		Hands	No cause	*In statu quo*	Nervous
,,		,,	Fright	Well	
,,		Legs and arms	No cause	,,	Nervous
Uneven systolic apex murmur		Twitching arms for 3 years	,,	,,	Stupid
Regular		Twitching of eyes and face	Fright	*In statu quo*	Iridectomy four years ago, twitching and awkward movements ever since
		—	No cause	Well	A stupid child
	2nd	—	,,	,,	
,,		—	,,	,,	
,,	2nd	Hands	,,	,,	
Mitral murmur		—	Fright	Improved	
Regular		—	No cause	Well	
,,		Hands	Overwork at school	,,	A clever child
		Hands and legs	No cause	,,	

SUB-SERIES II.

Heart Condition	2nd or 3rd attack	Part of Body where Commenced	Supposed Cause	Result	Remarks
Regular		Left arm & leg	—	Well	Mental defect ?
,,		Right side	A fright	,,	
,,	2nd	—	—	,,	
,,		—	—	,,	
,,	3rd	—	Fright	,,	See No. 38
,,	2nd	Limbs and face	No cause	,,	
,,		,,	? Fright	,,	
Syst. murmur		Left side	Being run over (*i.e.* fright)	,,	
—		Limbs generally affected	Over study	,,	
Regular	2nd	Right side	No cause	,,	
,,		—	? Fright	,,	
,,		—	No cause	,,	
,,	2nd	—	? a fall	,,	See No. 50
,,		Facial & general	'Brain fever' (3 atks.)	,,	
Irregular		—	Over study	Taken out by friends	
Syst. murmur		Right hand	Rheumatism	Well	
Regular		Rt. hand & arm	Over fatigue	Improved	
,,	2nd	—	No cause	Well	

SUB-SERIES II—*continued.*

No.	Name	Age	If previous Whooping-cough	If previous Rheumatism	If Rheumatism in Family
19	Henry B.	11	Whooping-cough	o	o
20	Annie E.	11	,,	o	Father
21	Edith T.	9	,,	Rheumatism	o
22	Helen K.	9	,,	o	o
23	Arthur W.	10	,,	o	o
24	Edward F.	7	,,	Rheumatism	Mother
25	Alfred G.	7	,,	—	—
26	Sarah B.	9	,,	o	Sister
27	Arthur C.	11	,,	*Rheumatic fever*	o
28	Rose L.	7	o	o	o
29	Louisa J.	9	Whooping-cough	o	—
30	Anne G.	2	,,	Rh. *just before*	o
31	Hannah B.	9	,,	Rheumatism	o
32	Sydney P.	6	,,	o	o
33	Annie P.	9	,,	o	Mother & father
34	Albert H.	11	,,	o	o
35	Anne P.	3	o	Redness or swelling, feet & hands	Mother's family
36	Mary Anne D.	9	o	o	o
37	Elizabeth H.	11	Whooping-cough	o	o
38	Annie G.	10	,,	Rheumatism [1]	o
39	Margaret M.	7	,,	o	o
40	Annie C.	10	,,	o	o
41	Lydia H.	7	o	o	o
42	Eleanor W.	6	Whooping-cough	o	o
43	James F.	8	,,	o	o
44	Olive T.	4	o	*Rheumatic fever*	Family
45	Florence F.	8	Whooping-cough	Rheumatism	
46	Edward S.	9	,,	o	o
47	William B.	6	,,	Pain in joints, no swelling or redness	o
48	Elizabeth R.	9	,,	o	
49	Ellen B.	10	,,	o	o
50	Jane L. W.	7	? Whooping-cough	Father rh.	Sister
51	Florence M.	7	Whooping-cough	o	o

[1] Hands and knees swollen 14 days, but did not keep bed.

SUB-SERIES II—*continued.*

Heart Condition	2nd or 3rd attack	Part of Body where Commenced	Supposed Cause	Result	Remarks
Syst. murmur (at first)	2nd	—	Frightened by horse	Well	
Regular		General	No cause	,,	
		Hands	Over study	,,	
,,		—	No cause	,,	
Mitral regurg.	2nd	General	No cause. In 1st attack fright, dog, on side affected	,,	
Irregular		—	—	...	
Aortic regurg.		—	—	Developed chorea on taking cold at Cromwell House; was taken out by friends	
Mitral	2nd	Legs	No cause	Well	
,,		Right hand	Fright, horse running away with him	,,	
Regular		Left hand	No cause	,,	
,,		Left side	—	,,	
,,		General	? *Rheumatic fever*	,,	
,,		,,	Falling down and breaking a jug	,,	
,,		Arms	No cause	,,	
,,	2nd	Left side	Fright	Improved	
,,		Left hand	No cause	Well	
Syst. murmur		Right arm & leg	? Rheumatism	,,	
Regular		General	Fright[1]	,,	
Mitral murmur		Right hand	No cause	,,	
Regular (uneven)	2nd	Left arm (not leg)	? Rheumatism, has complained of pain in left side since so-called rheumatism	,,	
Mitral	2nd	Left side	Fright (both attacks)	,,	
Uneven		General (began in right hand)	?	,,	Begun with languor and extreme nervousness
Regular	3rd	General (began in right arm)	Fright, dog jumping up right side	Improved	
Syst. murmur		General	No cause	Well	
Regular	2nd	Hands	,,	,,	
Syst. murmur		General	? Rheumatism	,,	Appearance of mere shyness
Not regular		,,	Fright	Improved	
Regular		Left hand	,,	Well	
Aortic obstn.		Right hand	No cause	,,	
Mitral murmur	2nd	Left leg	—	,,	
1st sound thick at apex	2nd	Right side	Fright (on right side)	,,	
Not quite reg.	3rd	Left side most	After fall—1st attack fright	,,	
Mitral murmur		Left arm & face	Contending for school prize, much excited thereby	Improved	

[1] Ascertained at Highgate.

SUB-SERIES III.

No.	Name	Age	If previous Whooping-cough	If previous Rheumatism	If Rheumatism in family
1	Jane B.	11	Whooping-cough	Rheumatic pains	Father
2	Madeline P.	11	—	o	o
3	Emily W.	6	Whooping-cough	o	o
4	Florence P.	11	o	—	—
5	Alice J.	11	Whooping-cough	o	o
6	Elizabeth S.	7	o	Rheumatic pains	Father
7	John B.	11	Whooping-cough	Pains	Mother
8	Rosa R.	10	,,	o	o
9	Jesse M.	9	,,	Rheumatic pains	Father
10	Lilian H.	7	,,	o	o
11	Alfred B.	10	,,	o	o
12	Edwin C.	7	,,	o	o
13	Sidney P.	7	,,	o	o
14	Eliza S.	10	,,	*Rheumatic fever*	Father& mothe
15	Ellen M.	11	,,	o	o
16	Elizabeth R.	11	,,	*Rheumatic fever*	o
17	James M.	10	,,	Rheumatic pains	Mother (rh.fvr.)
18	Margaret P.	8	,,	o	Mother's sister
19	Phœbe B.	11	,,	Rheumatic pains	o
20	Caroline W.	11	,,	o	o
21[1]	James F.	8	,,	o	o
22	Florence S.	8	,,	o	o
23	Agnes D.	11	,,	o	o
24	Elizabeth C.	10	,,	o	o
25	Louisa R.	9	,,	o	Mother (rh.fvr.)
26	Marianne H.	9	,,	o	,,
27	Catherine S.	8	,,	o	o
28	Louisa J.	9	,,	o	Father
29	Mary B.	5	o	Rheumatic pains	o
30	Robert L.[1]	9	o	o	o
31	Emily P.	8	o	o	o
32	Florence W.	8	Whooping-cough	o	Mother
33	Alice T.	6	,,	o	o
34	Anne T.	9	,,	o	o

[1] Got sudden (very temporary) paralysis of muscles of left shoulder, January 22, 1881.

ABSTRACT: 1st series	52	[less 1 (No. 35) admitted twice]	51
2nd series	51	[less 2 (Nos. 5 and 13) admitted twice]	49
3rd series	34	[less 2 (Nos. 21 and 28) admitted twice]	32
	137		132

SUB-SERIES III.

Heart Condition	2nd or 3rd attack	Part of Body where Commenced	Supposed Cause	Result	Remarks
Mitral murmur	2nd	—	Fright	Well	
,,	2nd	Left side	Fright (both attacks)	,,	
,,		Right hand	No cause	,,	
Regular		Right side		,,	
,,		General	Nothing entered for these six under this heading	,,	
Mitral murmur		Hands		,,	
Regular	4th	General		Improved	
,,		,,		—	
,,		Left arm		Well	
Mitral		General	Fright	,,	
Irregular		Arms and legs	No cause	—	
Regular		General	,,	Well	
,,	2nd	Arms	School examination	,,	
,,		General	*Rheumatic fever*	,,	
Mitral	2nd	,,	No cause	,,	
Regular	3rd	Left side	Fright	,,	
,,		General	No cause	,,	
,,	3rd	,,	No cause—1st from fright	,,	
,,		,,	No cause	,,	
Mitral		,,	,,	,,	
Regular	3rd	Hands	Fright from blow	,,	See 43
Soft m. at apex		General	Fright	,,	
Not quite reg.	2nd	,,	1st fright, 2nd scolding at school	,,	
Regular	3rd	,,	2nd and 3rd attacks fright	,,	
,,		,,	Fright	,,	
Irregular	3rd	,,	1st fright, 2nd and 3rd unknown	Improved	
Regular	3rd	,,	1st fright, 2nd and 3rd unknown	Well	
,,	2nd	Left side	No cause	,,	See 29 (2nd series)
Syst. murmur		General (face most affected)	,,	,,	
Regular		Face & left side	,,	,,	
,,		General	,,	,,	
,,	3rd	Right side only	1st fright, 2nd unknown, 3rd schoo	,,	
Irregular		General (hands and right side most)	Fright	,,	
Regular		General	School punishment	,,	

ANALYSIS OF TABLE A.

1. Age and Sex.

Total number, 132. Boys, 33 ; girls, 99 ; viz.,
Of twelve years old : 2 girls.
Ten and eleven years old : 10 boys, 34 girls.
Nine years old : 7 boys, 20 girls.
Eight years and under : 16 boys, 43 girls.

2. Previous Attacks of Chorea.

2nd attacks, 27.
3rd ,, 10.
4th ,, 3.

3. (*a*) Antecedent Whooping-cough in Choreic Children.

The point was ascertained in 120 cases.
Of 28 boys, 4 had not had whooping-cough ; i.e. 1 in 6.
,, 92 girls, 16 had not had whooping-cough ; 1 in 5·8.

(*b*) Antecedent whooping-cough in three independent series of cases of 132 each, taken consecutively without reference to particular illness :—

In 1st series, 27 of 105 had not had whooping-cough ; 27 no record.
In 2nd series, 31 of 110 had not had whooping-cough ; 22 no record.
In 3rd series, 33 of 104 had not had whooping-cough ; 28 no record.

Hence it appears that 2 in 12 choreic children are without history of whooping-cough, whilst 2 in 5 non-choreic children are without such history. *Whooping-cough has thus more than twice the frequency in the choreic over the non-choreic.*

4. Rheumatic Connection.

In the 1st Sub-series of 51 cases :—

1 had had rheumatic fever previously.
2 ,, ,, rheumatism previously.
4 were doubtful as to this point.
3 were not ascertained.

In the 2nd Sub-series of 49 :—

4 had had rheumatic fever.
6 had probably had rheumatism.
2 were too doubtful to reckon.
1 was not ascertained.

In the 3rd Sub-series of 32 :—

2 had had rheumatic fever.
7 ,, ,, pains, probably rheumatic.
1 was not ascertained.

Hence 132 cases give 7 who have had rheumatic fever,
14 or 15 who have had pains, probably rheumatic ;
6 that were doubtful,
5 not ascertained.

In 73 cases where that point is noted rheumatism is in the *family history* of 19 ; of these 19, 9 have themselves had rheumatism, 10 have not. Of these 9 who have rheumatism, both themselves and in their families, rheumatism might have been the *immediate* cause of chorea in 2, and rheumatic fever in 1 (No. 14. Sub-series 3).

[The above is as exact an account of the rheumatic connection as the facts admit of ; precise accuracy cannot be insisted on. See p. 33.]

5. Exciting Cause.

Of the 132 cases :—

Supposed *exciting* cause not entered in	20
Not to be ascertained in	45
Rheumatism *exciting* cause in	4 (?3)
Rheumatic fever *exciting* cause in	2 (?1)
Fright or sudden shock in	39 (?2)
Some nervous strain, school discipline, hard lessons, &c., in	18 (?2)
Previous illness in	4

[The figures within the brackets denote proportion of doubtful cases under each heading.]

Hence it appears that of the 112 cases of which the exciting cause is presumably known, 57 or 53 (*say one half*) *have their origin in some notable nervous shock.*

6. Implication of the Heart.

Of the 132 cases :—

No report as to heart condition in 13.[1]

In 2 cases of twelve years old there was heart defect in none.

In 44 cases of ten and eleven years old there was heart defect in 16 (murmur in 13, irregularity in 3).

In 27 cases of nine years old there was heart defect in 3 (murmur in 2, irregularity in 1).

In 59 cases of eight and under there was heart defect in 26 (murmur in 16, irregularity in 10).

Hence, in 132 cases there is heart defect in 45, *the largest proportion of such defect appearing with the youngest children.*

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[1] In the majority of these, if not all, it may safely be assumed that there was no heart defect, and that express note of the heart was therefore not entered.

8. Place of Origin of the Chorea as regards the Several Groups of Muscles.

Of the 132 cases :—

No report as to place of origin in	24
Chorea 'general' from the first in	36
Chorea commenced in a particular group of muscles (whether or not becoming general after) in . .	69 to 72

Locality of first onset distributed as follows :—

Right side	13 times
Left side	15 ,,

('Side' signifying generally arm and leg, but sometimes the arm only).

Both hands	10 (or 11) time
,, arms	twice
,, legs	Once
Right hand	10 time
Left hand	4 ,,
Right arm	3 ,,
Left arm	6 ,,
,, leg	Once
Right leg	0
Face	4 time

Hence, taking sides of the body (whether arm, leg, or both chor was *right-sided in* 26, *left-sided in* 26 ; taking upper limbs against lower, occupied *the upper in* 36 (*hand or hands in* 25, *arm or arms in* 11), *t lower in* 2.

TABLE B.

45 CONSECUTIVE CASES OF CHOREA ILLUSTRATING THE SAME POINTS AS TABLE A, BUT IN SOMEWHAT OLDER SUBJECTS.

No.	Name	Age	If Rheumatism previous	Heart condition	Starting places. Supposed cause	Remarks[1]
1	Walter N. .	9	o	Regular	*Face* and *respiratory muscles*	Second attack. First from *fright*
2	Rebecca H. .	5	?	Irregular occasionally	*Right hand*; suddenly screamed causelessly	
3	Jane L. . .	13	o	—	Left arm; over study	
4	Louisa D. .	11	o	—	*Hands*; began with laughing and crying	Second attack. Sister had chorea
5	Thomas H. .	8	?	—	*Hands*	Nervous and frightened
6	Annie Y. . .	13	?	—	*Left wrist dropped*; then general fidgets	
7	Fannie F. .	11	o	—	*Arms*; afterwards rhythmic twitching of face	Awkward movements four years; operation on eyes
8	Frederick H. .	11	o	—	*Eyelids*; *scorched* by gunpowder *in face*	
9	Charles H. .	12	Acute rheumatism	—	*Legs, arms, face,* &c.; *deglutition*	Conium and zinc in high doses without result
10	Jane B. . .	13	?	—	*Frightened* by *fire* month before; *legs, arms, face*	Brother idiot
11	Ellen N. . .	16	o	—	*Face* and *right limbs*; fright in first	Second attack
12	Samuel A. .	14	o	—	Dropped baby 4 months before; much blamed; shortly after, jerking *left* side, then *face*, then *right* side	Constant grimacing; intelligent. Discharged uncured
13	Clara A. . .	9	Acute rh. (two years ago)	—	Both *hands* and *face*	School work, probable cause
14	Ellen B. . .	9	o	—	*Fright*—confined in cellar; *hands* and *face*	Much nervous trepidation

15	Girl (name omitted)	10	?	Mitral murmur	*Left hand*; after, arms and hands; *fright*—a family disturbance	
16	Alice S. . .	10	?	—	Fright in both attacks	Second attack
17	Louisa A. .	12	0	Mitral murmur	Nervous since death in family; awoke screaming from *dream*, commenced twitching, at once, *arms* and, in less degree, *legs*	Violent for first two days; unable to stand
18	Alberta B. .	8	Acute rh. æt. 2½ years	—	*Impaired sensation* of left side; *leg most*; after abdominal pain	Two fits (the second in Hospital). Doubtful case, from imperfect report
19	Frederick C. .	11	0	Uneven	*Right leg*; suddenly, when going to school; then *left hand*, then *general*	Caned for bad writing day before
20	Alfred E. .	7	Rheumatism (?)	Mitral murmur	*Both legs* (left most) and *left arm*; *frightened* by woman, from whom he ran	In-patient before with pains in legs, not identified as rheumatic
21	Elizabeth C. .	21	Rheumatism	—	Face and left arm; set to *work* when imperfectly convalescent.	Second attack; associated with paresis. (*Vide* Case 4, App. A)
22	Alice W. .	22	0	0	Fright	Combined with hysteria
23	Emma B. .	13	?	0	Spasmodic movement of *left hand and arm*; the left leg weak	Imperfectly reported
24	Emily H. .	10	0	—	Right side, especially hand; *first* attack in *left hand*, after flower-pot falling on it	Second attack
25	Elizabeth D. (admitted twice)	12	0	—	Both attacks within year, and from *fright*; hands; the *first* attack began in left leg	Second attack
26	Harriet R. .	8		—	Arms and legs; fright	Falling against railings
27	Phœbe B. .	10	?	—	Hands; followed *scarlatina*	*Several previous attacks*

[1] These patients all recovered with the exceptions notified in this column.

No.	Name	Age	If Rheumatism previous	Heart condition	Starting places. Supposed causes	Remarks
28	Mary A. T. .	5	o	Loud blowing murmur	Fright, by seeing sister jump from window ; *general*	Unable to control movement or maintain stillness, especially on observation and after mother's visits
29	Charlotte F. .	10	? probably o	Mitral varying murmur	*Hands* ; frightened by quarrel	Was sent out in course of family riot to fetch police
30	Clara P. . .	15	o	Heart intermittent	*Face* ; then hands ; first attack *fright*	Second attack
31	Anne C. . .	13	o	No murmur	*Right hand* ; then *face* and *tongue* ; sometimes *right leg*	Involuntary movements of right hand ; no cause known
32	Emily J. M. .	11	Slight rheumatism before admission in ankles and feet	Systol. murmur ; second sound reduplicated. (Incontinent urine)	Cause of second attack, *rheumatism* ; of first, *fright*	Second attack. Limbs affected (?)
33	Maria G. .	12	o	—	A rhythmical *twitching* of *head and shoulders* ; worse on notice	Mother choreic in pregnancy ; now in asylum
34	Annie M.[1] .	13	o	Uneven	First *right side* ; then *left side* ; after tooth extraction and *fall*	Violent and general ; later, righ hand violently choreic. (Case 13, App. A)
35	Florence B. .	13	Rh. fever 3 months before	Mitral murmur	*Left arm* ; *frightened* by woman	Some dyspnœa since rheumatism
36	Elizabeth P. .	15	o	Irregular	*Right side* both attacks ; week after *fright*	Second attack. First, after a death in family
37	Elsie D. . .	9	Rh. fever (2 months ago)	Loud systolic apex (rh.)	*Right hand* ; later, right foot	Suggested cause, school when imperfectly well
38	Lewis L. .	13	o	Normal	*Hands* ; very gradual access	After scarlatina ; attributed t school competition soon after

39	William S. .	16	Rheumatism	Murmur appeared with paresis	General *hysterical* fit, at first and later; cause hard manual work	Got delusions, and was for a while hysteric and violent; dropped wrist. (Case 8, App. A)
40	George C. .	14	0	Natural	*Right arm* and *hand*; after, general	Attributed to heavy lifting of trays, &c.
41	Louisa P. .	10	Rheumatism	No murmur	*Left side*; then general; *right* side most; from fright	A moderate attack, becoming chronic; made severe by fright; stiff joint, &c. (Case 10, App. A)
42	Samuel S. .	13	(?) Rheumatism	Murmur appeared and disappeared under observation; occasionally irregular	Left arm and face; after, general; incontinent urine	A second attack. The first after pain in thigh (? rheumatism); no cause for second. Much worse after hearing bad news. (Case 14, App. A)
43	Jane C.[2] . .	21	Rheumatism in right hand one month before chorea	A varying systolic murmur between apex and base	*Left hand, left foot, left of face*; strictly one-sided	Married four months; pregnant two months (Dr. Potter); no fright or shock. (Case 12, App. A)
44	Emily R. .	13	0	Normal	Right arm and hand; quite unable to write; afterwards severe, general	Working for school examination; writing very much
45	Mary E. G. .	17		Natural	Spasmodic jerking of head	Chronic affection of three and a half years duration; but getting worse. Doubtful history of fright. Partially recovered under treatment

[1] The muscles were carefully faradised in this case, and the nerves and their inter-muscular branches found to be perfectly natural in reaction.

[2] Was distinct, but not severe, on admission, as *left hemichorea* of five weeks duration. Patient made rapid recovery in less than week.

ANALYSIS OF TABLE B.

1. Age and Sex.

Total number, 45. Boys, 10 ; Girls, 35.
Over thirteen years : 3 boys, 7 girls.
Twelve and thirteen years : 2 boys, 12 girls.
Ten and eleven years : 2 boys, 9 girls.
Nine years old : 1 boy, 3 girls.
Eight years old and under : 2 boys, 4 girls.

2. Previous Attacks of Chorea.

Second attacks : 11
Several previous attacks : 1

3. Rheumatic Connection.

Had had rheumatic fever, 4
,, ,, rheumatism, 5
Were doubtful, 11

4. Exciting Cause.

Rheumatism exciting cause in 2
Fright, or sudden nervous shock, in 2
Exciting cause, absent in 15

5. Implication of the Heart.

No report as to heart in 21[1]
Of the 10 cases over thirteen years old there was heart defect in 4
Of 14 cases twelve and thirteen years old ,, ,, ,, 4
Of 11 cases ten and eleven years old ,, ,, ,, 4
Of 4 cases nine years old ,, ,, ,, 1
Of 6 cases eight years old and under ,, ,, ,, 3

Hence, in 45 cases there is heart defect in 16.

---

[1] In the majority of these, if not in all, it may safely be assumed that there was no heart defect, and that express note of the heart was therefore not entered.

6. PLACE OF ORIGIN OF THE CHOREA AS REGARDS THE SEVERAL GROUPS OF MUSCLES.

Of the 45 cases :—

No report as to place of origin in 2.
Chorea general from the first in 5.
,, commenced in a particular group of muscles in 38.

Locality of first onset distributed as follows :—

Right side	4	Left hand	1
Left side	4	Right arm	1
Both hands	8	Left arm	4
,, arms	2	,, leg	1
,, legs	1	Right leg	1
Right hand	4	Face	5

Two were examples of spasmodic twitching of head and shoulders.

RESULTS FROM THE TWO TABLES TAKEN TOGETHER.

1. AGE AND SEX.

Total number, 177. Boys, 43 ; Girls, 134.
Over thirteen years : 3 boys, 7 girls.
Twelve and thirteen years : 2 boys, 14 girls.
Ten and eleven years : 12 boys, 43 girls.
Nine years old : 8 boys, 23 girls.
Eight years old and under : 18 boys, 47 girls.

2. PREVIOUS ATTACKS OF CHOREA.

Second attacks : 38 (more than one-fifth).
Third attacks : 10.
Fourth attacks : 4.

3. RHEUMATIC CONNECTION.

Had had rheumatic fever, 11.
,, ,, pains probably rheumatic, 20.
Were doubtful, 17.
Not ascertained, 5.

4. EXCITING CAUSE.

Rheumatism, acute or not, appeared to be exciting cause in 8 (4 of these doubtful).
Previous illness, exciting cause in 4.
Fright or some nervous shock or strain, exciting cause in 85—nearly half (4 of these doubtful).
Exciting cause not to be ascertained, 60.
,, ,, not entered, 20.

5. Place of Origin as Regards the Several Groups of Muscles.

Of the 177 cases :—

Place of origin not entered or not known in 26.
Chorea general in 41.
Commenced in particular group of muscles in 110.

Locality of first onset distributed as follows :—

Right side . .	17	Left hand . .	5
Left side . .	19	Right arm . .	4
Both hands .	18 (or 19)	Left arm . .	10
,, arms . .	4	,, leg . .	2
,, legs . .	2	Right leg . .	1
Right hand . .	14	Face . . .	9

Five cases indefinite or anomalous.

Hence, in 151 cases (*i.e.* excluding 26 not known) :

Chorea was *both* sided in 65 (or 66).
,, ,, in the face in 9.
,, ,, *one* sided in 72.
,, ,, indefinite or anomalous in 5.

Chorea affected the *upper limbs* in 55.
,, ,, the *lower limbs* in 5.
,, ,, the *right hand* 14 times, against the *left hand* 5 times ; but the *right arm* only 4 times, against *the left* 10 times.

Of all parts of the body, *chorea began most often in both hands* ; while in either one or both hands it began in 38 instances, *i.e.* in more than a quarter of the total number whose place of commencement was known.

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